REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	Sep 94	

4. TITLE AND SUBTITLE
Virtual Organizations: an examination of Structure & Performance in Air Force Acquisition Teams

5. FUNDING NUMBERS

6. AUTHOR(S)
Caisson M. Vickery

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
AFIT Students Attending:
Florida st Univ

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/CI/CIA
94-045D

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
DEPARTNEMT OF THE AIR FORCE
AFIT/CI
2950 P STREET, BDLG 125
WRIGHT-PATTERSON AFB OH 45433-7765

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release IAW AFR 190-1
Distribution Unlimited
BRIAN D. GAUTHIER, MSgt, USAF
Chief Administration

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

14. SUBJECT TERMS

15. NUMBER OF PAGES
184

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

THE FLORIDA STATE UNIVERSITY

COLLEGE OF BUSINESS

VIRTUAL ORGANIZATIONS:

AN EXAMINATION OF STRUCTURE AND PERFORMANCE

IN AIR FORCE ACQUISITION TEAMS

By

CAISSON MOATES VICKERY

A Dissertation submitted to the
Department of Information and Management Sciences
in partial fulfillment of the
requirements of the degree of
Doctor of Philosophy

Degree Awarded:
Fall Semester 1994

The Members of the Committee approve the dissertation of Caisson M. Vickery on 26 October 1994.

Thomas D. Clark Jr.
Professor Directing Dissertation

Stephen Celec
Outside Committee Member

Robert W. Zmud
Committee Member

V. Sambamurthy
Committee Member

Larry Giunipero
Committee Member

Approved:

Melvin T. Stith, Dean, College of Business

This dissertation is lovingly dedicated to my wife and children who have learned to put up with me and to love *strawberries*.

"Sometimes nothin' is a pretty good hand. . ."

I would like to acknowledge the individuals who provided invaluable assistance throughout this process. Dr. Clark, who has continually provided insight and motivation. My committee which provided much needed direction and advice. John . . . you know why. But, most of all, Linda without whose love and support I would not have endured.

Thank-you all. . .

TABLE OF CONTENTS

LIST OF TABLES..... ix
LIST OF FIGURES..... x

1. VIRTUAL ORGANIZATIONS AND ALLEGIANCE..... 1

Introduction..... 1
Research Questions..... 5
Overview of Methodology..... 7
Context of the Study..... 8
Plan of the Dissertation..... 9
Part 1: The Proposal 10
Part 2: Analysis and Discussion 11
Part 3: Implications for Future Research and Conclusions..... 11

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK... 12

Introduction..... 12
Organizational Environments and Environmental Linkages..... 12
Interorganizational Relationships..... 18
Virtual Organizations..... 26
Organizational Architecture..... 29
Organizational Design..... 30
Attitude Towards Control..... 33
Nature of the Relationship Between the Parent Organization and the Virtual Organization..... 35
Member Allegiance..... 38
Organizational Commitment..... 38
The Conceptual Model..... 43

3. RESEARCH MODEL..... 45

Introduction..... 45
The Research Model..... 45
Definitions and Relationships..... 49
Performance..... 50
Task Complexity..... 51

Strength of the Virtual Organization's Empowerment..... 52
Member Allegiance in the Virtual Organization..... 53
Climate of the Virtual Organization..... 55
Architecture of the Parent Organization..... 56
Nature of the Relationship Between the Parent Organization and the Virtual Organization..... 57
Hypotheses..... 59

4. METHODOLOGY..... 63

Introduction..... 63
Validation..... 65
Data Collection..... 66
Instrumentation..... 71
Architecture of the Parent Organization..... 71
Nature of the Relationship Between the Parent Organization and the Virtual Organization..... 72
Member Allegiance in the Virtual Organization..... 72
Climate of the Virtual Organization..... 73
Strength of the Virtual Organization..... 73
Task Complexity..... 74
Performance..... 75
Analysis..... 76
Team Level Analysis..... 77
Individual Level Analysis..... 80
Follow-Up Interviews 82
Summary..... 82

5. ANALYSIS AND RESULTS..... 84

Introduction..... 84
Pilot Study..... 84
Interviews..... 85
Sampling Procedures 88
Verification and Validation of Results..... 89
Item Analysis..... 89
Architecture of the Parent Organization.. 93
Nature of the Relationship Between the Parent Organization and the Virtual Organization..... 95
Member Allegiance..... 96
Climate of the Virtual Organization..... 98
Strength of the Virtual Organization..... 99

Performance..... 100
Factor Analysis..... 102
Architecture of the Parent Organization.. 102
Nature of the Relationship Between the Parent Organization and the Virtual Organization..... 104
Member Allegiance..... 106
Climate of the Virtual Organization..... 106
Strength of the Virtual Organization..... 107
Performance..... 109
Analysis Results..... 112
Research Question One..... 112
Research Question Two..... 119
Research Questions Two A and Two B..... 121
Summary..... 127

6. DISCUSSION..... 129

Introduction..... 129
Empirical Findings..... 129
Factor Analysis Discussion..... 131
Architecture of the Parent Organization.. 131
Nature of the Relationship Between the Parent Organization and the Virtual Organization..... 132
Member Allegiance..... 133
Climate of the Virtual Organization..... 133
Strength of the Virtual Organization..... 134
Performance..... 134
Regression Analysis and Results..... 135
Research Question One..... 136
Research Question Two..... 138
Research Questions Two A 140
Research Questions Two B 141
Implications for Practitioners..... 144
Generalization of the Findings..... 147
Limitations of the Research..... 149
Summary..... 151

7. IMPLICATIONS FOR FUTURE RESEARCH AND CONCLUSIONS..... 153

Introduction..... 153
Objectives of the Research..... 153
Implications for Future Research..... 155
Solutions to the Limitations of the Research 155
Future Research..... 158
Conclusions..... 160

APPENDICES..... 161

A. Organizational Responsibility Grouping Chart for the Acquisition Team..... 161
B. Questions to Validate the Model..... 163
C. Instrumentation..... 165

SELECTED BIBLIOGRAPHY..... 172

BIOGRAPHICAL SKETCH..... 182

LIST OF FIGURES

Figure		Page
1-1	Plan for the Dissertation	10
2-1	The Conceptual Model	43
3-1	Research Model	49
3-2	Research Model Detail	58
4-1	Plan of Methodology	64
4-2	Air Force Acquisition	67
4-3	Team Level Analysis	77
4-4	Individual Level Analysis	81
5-1	Revised Model Using Complexity as a Control	118
6-1	Modified Model	130

LIST OF TABLES

Table		Page
3-1	Matrix of Allegiance	54
4-1	Data Collection Scheme	69
4-2	Performance Measure	76
4-3	Example Output from Hierarchical Regression Analysis	79
5-1	Summary of Instrumentation	91
5-2	Reliability and Item Analysis for Architecture of the Parent Organization	94
5-3	Reliability and Item Analysis for Nature of the Relationship	95
5-4	Reliability and Item Analysis for Virtual Organization Commitment	97
5-5	Reliability and Item Analysis for Parent Organization Commitment	98
5-6	Reliability and Item Analysis for Climate of the Virtual Organization	99
5-7	Reliability and Item Analysis for Strength of the Virtual Organization	100
5-8	Reliability and Item Analysis for Performance	101
5-9	Items Deleted in Item Analysis	102
5-10	Factor Analysis of Architecture of the Parent Organization	104
5-11	Factor Analysis of Nature of the Relationship	105
5-12	Factor Analysis of Climate of the Virtual Organization	107
5-13	Factor Analysis of Strength of the Virtual Organization	108
5-14	Factor Analysis of Performance	109
5-15	Items Deleted in Factor Analysis	110
5-16	Summary of Factor Analysis	111
5-17	Regression Models and Variables	113
5-18	Pearson Correlations for Team Level Analysis	115
5-19	Regression for Research Question One	116
5-20	Regression for Research Question Two	120

5-21 Pearson Correlations for Individual Level Analysis..... 123
5-22 Regression For Research Question Two A and B Member Allegiance..... 123
5-23 Regression For Research Question Two A and B Climate of the Virtual Organization..... 125
5-24 Summary of Results..... 127

ABSTRACT

Caisson M. Vickery, PhD.
Florida State University, 1994
Major Professor: Thomas D. Clark Jr., PhD.

Organizations are increasingly facing more dynamic environments. Often the time frame involved is too small for the organization to adopt formal structural changes in response to these environments. Increasingly, organizations are turning to virtual organizations to respond to this dynamic environment. Virtual organizations are temporary groupings of workers that meet task needs without formal change to the organization. Through the use of virtual organizations, the flexibility of the traditional organization is augmented. A research model is formulated that relates the strength of the virtual organization to performance. The model is tested with a sample of 273 Air Force acquisition managers comprising 84 teams. A measurement scheme for the strength of the virtual organization is developed and validated. A hierarchical regression scheme confirms that stronger virtual organizations perform better in complex task situations. The implications of these findings are explored.

CHAPTER 1

VIRTUAL ORGANIZATIONS AND ALLEGIANCE

Introduction

Organizations are increasingly facing more dynamic environments. These environments require the organization to adapt quickly. Often the time frame involved is too small for the organization to respond with formal structural changes. Increasingly, organizations are turning to virtual organizations to respond to this dynamic environment (Mackenzie, 1986b; Hircshhorn and Gilmore, 1992; Mowshowitz, 1992). Virtual organizations are temporary groupings of workers that meet task needs without formal change to the organization. Traditional organizations are often rigid and inflexible (Mintzberg, 1983). Through the use of virtual organizations, the flexibility of the traditional organization is augmented.

In the traditional organization, boundaries and responsibilities are clearly delineated and are an integral part of the organization's structure. Organizational position and hierarchy clearly spell out responsibilities and authority. This organizational structure tends to be rigid and inflexible. The requirement to respond to a

dynamic environment has blurred these areas of responsibility and authority. The allegiance of and the roles played by the members and the power structure of the organization clearly are affected by the existence of a virtual organization.

Traditionally, organizational change has been explained through classical theories of organizational design. Organizational design has concerned itself with the structure of an organization. As defined by Mintzberg, organizational design is the sum total of the ways in which the organization divides its labor into distinct tasks and divides its labor among these tasks (Mintzberg, 1983). More recently, organizational design has been defined as the way an organization adapts itself to change. Thus, organizational design is the continuing cycle of adapting the organization's goals and strategies, arranging and maintaining the organizational technology to implement these strategies, and producing the desired results in the face of changing environments while the organization continues to function (Mackenzie, 1986a).

These basic definitions of organizational design fall short when adapted to today's networked organizations. The existence of sophisticated information technology has both enabled and encouraged the formation of virtual positions within the organization. The virtual organization is an ad hoc, temporary grouping of individuals with diverse

abilities and responsibilities. The purpose of the virtual organization is to respond to task requirements in ways that are not specifically delineated in the organizational charts of an organization.

But how can the existence of the virtual organization be verified? As of yet, the virtual organization has been rigidly defined as groups working outside traditional organizational structures (Mackenzie, 86a; Mackenzie, 86b). Can the existence of the virtual organization be observed and measured in terms of its strength? If so, can the parent organization be managed to optimally promote the presence of virtual organizations? The dynamics of the virtual organization are developed in the research model found in chapter three.

In order to measure the existence or strength of the virtual organization, the actions and behaviors of this organization must be described and measured. Next, the antecedents of the strength of the virtual organization must be examined. Two major components of the virtual organization appear to hold sway on the effects this entity has on organizational performance: allegiance of members and the climate of the virtual organization. Finally, the issues in the parent organization that affect allegiance and architecture in the virtual organization must be considered.

In chapter three, a model is introduced to explain the nature of the virtual organization and its performance. The

model suggests that performance can be explained in terms of the strength of empowerment of the virtual organization. Strength is envisioned as the degree to which the virtual organization has independent goals, uses unique solutions to achieve goals and the degree to which members perceive their performance in the virtual organization to affect their overall evaluation.

Variations in strength are caused by the interaction of member allegiance in the virtual organization and climate of the virtual organization. Member allegiance is the degree to which individuals feel attached or obligated to the virtual organization rather than the parent organization. The climate of the virtual organization is defined by the degree of autonomy and potency that members of the virtual organization possess.

Both allegiance and climate of the virtual organization are affected by the architecture of the parent organization and the nature of the relationship between the virtual organization and the parent organization. Architecture of the parent organization is defined by the structure of the parent organization and the levels of centralization and formalization in that organization. The nature of the relationship between the virtual organization and the parent organization is seen as a combination of the power retained by the parent organization and the amounts of formal

reporting and supervision imposed on the virtual organization.

How does the existence of and indeed the design and control of the virtual organization affect the traditional structure of organizational commitment? By relying on the virtual organization to perform tasks not traditionally covered by the organization's structural chart, the managers of the parent organization relinquish their control of the task. These managers have historically been given clear roles of responsibility and authority. If the traditional sources of power used by managers in the work place have not been superseded by the existence of the virtual organization, the effect of these powers has certainly been moderated. The purpose of this research is to examine the effects that the existence of and the design and control of the decision making authority within a virtual organization have on the organizational commitment and thus performance. By managing the design and controlling the virtual organization, allegiance to the task can be encouraged and thus effectiveness and efficiency gained.

Research Questions

This dissertation proposes to answer the following research questions:

1. How does the strength of the virtual organization affect its performance?

Performance may be measured in terms of customer satisfaction. By measuring customer satisfaction with the process, speed of the process and product received, a good measure of performance is obtained.

2. What factors interact to affect the strength of the virtual organization?

Due to its nature, the virtual organization will be strengthened through variables that encourage potency and autonomy among its members.

2a. What characteristics of the parent organization cause strong virtual organizations?

The management imposed architecture may cause the formation of these virtual positions. If the antecedents of the virtual position can be identified, then an architecture for controlling the formation of these positions will emerge.

2b. What is the nature of the relationship between the virtual organization and the parent organization that causes strong virtual organizations?

The nature of this relationship will be determined by the amount of power that the parent organization retains, the degree of formal supervision placed on the virtual organization and the frequency of formal reporting required.

Thus, the overall objective of this research is to verify the existence and effect of the virtual organization on organizational performance. The specific context of the

study is the performance of government contracting offices. In order to achieve this objective, the following goals must be met:

1. The existence of the virtual organization must be verified. This can be done through examination of ongoing procurement projects. A measurement instrument for the strength of the virtual organization must be developed. Variables affecting this measure include allegiance, the use of unique solutions, independence of goals, formal supervision, and unclear evaluation/reporting requirements.
2. The correlation between strength of the virtual organization and specific organizational architecture or structure must be examined. This will give an indication of management strategies that promote or inhibit the formation of the virtual organization.
3. The correlation between the strength of the virtual organization and task performance must be measured. This will verify the efficacy of the virtual organization.

Overview of Methodology

The methodology will combine the use of secondary data, surveys and structured interviews. Secondary data will be used to determine organizational architecture and task characteristics. This will be verified through the interviews. Surveys will be used to measure allegiance, variables measuring the virtual organization and performance

variables. Again, this data can be verified to an extent through the interview process.

Context of the Study

The field of government contracting, specifically U.S. Air Forces weapons' systems, provides a rich context for this study. The parent organization, a Systems Program Office, provides the basis for organizational architecture and power retained. The virtual organization is the actual acquisition team. This team is made up of the contracting officer, the program manager and their corresponding subordinates. The allegiance of the members of this team and the organizational architecture of the acquisition team will define the strength of the virtual organization.

The relationship between the contracting officer and the program manager has long been an issue of concern for effective acquisition practices in the Air Force (Champlain, 1989). This research approaches the issue from the perspective that a typical acquisition team may act as a virtual organization. While some task responsibilities are clearly spelled out by regulations and office instructions, others are clearly performed by just such ad hoc groups.

The subordinate workers for the two offices are a classic example of conflicting allegiance. Allegiance can be to the program management office, the contracting office, or to the task at hand. The allegiance of the members of this group will have an integral effect on the outcomes of

the process. This research intends to examine whether, through the effective management of the allegiance or commitment of the members of the virtual organization, the efficiency of the acquisition process can be improved.

The model presented in chapter three shows that organizational architecture of the parent organization and the nature of the relationship between the virtual organization and the parent organization influence member allegiance and the climate of the virtual organization. Allegiance and architecture in turn create the strength of the virtual organization and finally, the strength of virtual organization affects performance. Organizational architecture will be measured through traditional structure variables (specialization, delegation, departmentalization, and span of control). Allegiance is viewed as a multi-dimensional construct: allegiances will lie toward the parent organization, the virtual organization, or to the task. Finally, performance will be measured through customer satisfaction variables (process, speed, and time).

Plan of the Dissertation

The overall plan of this dissertation is seen in figure 1-1. The study has three major parts. The first part is the proposal and contains chapters one through four. Part two is analysis and discussion and contains chapters five and six. Finally, part three discusses implications for future research and conclusions and contains chapter seven.

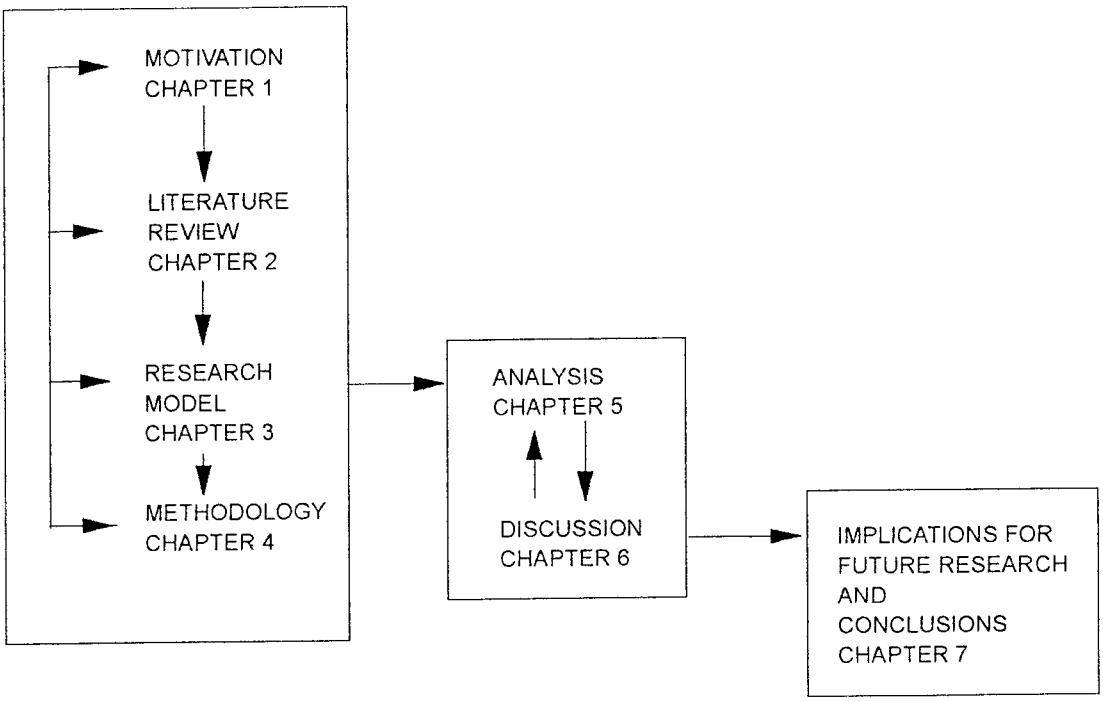

Figure 1-1
Plan for the Dissertation

Part 1: The Proposal

As stated above, the proposal provides the outline for the study. The first four chapters provide the motivation for the study (Chapter 1), the support of the model (Chapter 2), the research model (Chapter 3) and the plan for the methodology (Chapter 4).

Chapter one provides the motivation for the study as well as the purpose and research questions. The plan for the study is provided in this section.

Chapter two provides the theoretical basis for the study. A conceptual model is formed. A literature review is provided to support the conceptual model and frame the

research. As seen in figure 1, this is an iterative process. The study of the literature often modified the research questions and objectives.

The research model will be presented in detail in chapter three. This model will introduce and define the specific constructs to be studied in this research. The relationships among these constructs will be established.

The methodology section is provided in chapter four. The research model is detailed. The key variables to be studied are defined and operationalized. Finally, data collection and analysis methods are described and supported.

Part 2: Analysis and Discussion

This section contains the analysis of the data. A detailed description of the results of the analysis is provided in chapter five, while a discussion of the findings is provided in chapter six. Again, this is an iterative process. Issues during the discussion can lead to modified analysis of the data and vice-versa.

Part 3: Implications for Future Research and Conclusions

The final section discusses the implications of the study. The major contributions of the study are discussed. Further avenues of study for this subject are offered and finally, the conclusions section places the findings of the study into theoretical context in chapter seven.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Introduction

This chapter will present the theoretical framework for the study. First, a discussion of organizational relations is presented to provide a framework for why organizations interact. This section supports the notion that organizations interact for specific purposes. An argument is made that the virtual organization is an increasingly important method of organizational interaction. The virtual organization is defined and discussed as a type of organizational relationship. The antecedents for the strength of the virtual organization are presented in sections on organizational architecture, member allegiance, and organizational power. Finally, this chapter concludes with a presentation of the conceptual model as an introduction to the following chapter.

Organizational Environments and Environmental Linkages

Organizations are open systems that are faced with uncertainty and must develop coping mechanisms to effectively deal with this uncertainty (Thompson, 1967).

Thompson suggests that a major cause of these uncertainties is the organizational environment and thus much effort must be put into management of the organizational environment. This ability to control environments is seen as an expression of power and authority (Aldrich, 1971).

Why do organizations act as they do? It has been argued that organizations act as they must in order to survive in the face of external pressures (Thompson, 1967). Organizations can be seen as operating within a set of multi-leveled environments (Hodge and Anthony, 1991). Organizations are surrounded by layers of environment. The first level of the environment, the intermediate environment, is made up of suppliers, brokers, employment agencies, or service agencies. This intermediate environment acts as a bridge between the organization's micro environment and the macro environment. The micro environment is the organization's local pressures and external forces. The macro or global environment is the overall market structure in which the organization exists. The organization's everyday business requires it to constantly adapt to its changing environment. To understand the dynamics of this adaptation, environmental linkages must be examined.

Environmental linkages are any formal or informal structure through which an organization sends or receives services, supplies or information from its macro

environment. The organization has individuals, systems, networks and agencies directly responsible for environmental linkages. However, nearly all other units or individuals in the system have an indirect effect on the organization's ability to establish and maintain linkages with its environment.

Environmental linkages can take the form of individuals, organizational units, or intermediate agencies under contract with the organization for the purpose of mediating exchanges between the organization and the environment. Resource dependence theory requires that the organization attempt to mediate these interdependencies through linkages (Pffefer and Salancik, 1978). These linkages may be in the form of separate operating agencies which are tied to the organization and indirectly provide a line of transmission between the organization and its environment. Specific environmental linkages can take the form of boundary spanning units, strategic business units, environmental analysis units and business task forces. The specific types of environmental linkages are everyday operational parts of the organization's micro environment. Chief executive officers, board members, and business agents are seen as individuals having either direct or indirect responsibility for boundary maintenance or boundary spanning. Federations, joint business ventures and service agencies are boundary spanning activities that act in the

intermediate environment. These activities provide both direct and indirect linkages with the macro environment.

Coupling is a concept that is generally associated with interdependence among organizations and therefor appears in the literature in many places other than the linkage of organizations. However, because it represents a specific organization to environment tie, a discussion of coupling is relevant here. The term *coupling* refers to an organization's linkage to a specific subset of its macro environment (Aldrich, 1977). Coupling is termed to be either tight or loose dependent upon the organization's ties with this subset. Aldrich argues that the extent to which an organization is tightly or loosely coupled is the result of control exercised by a controlling authority. Depending on how tightly or loosely an organization is coupled, it will decrease or increase its ability to cope with significant changes in the organization's macro environment (Weick, 1976). Tightly coupled organizations have less ability to adapt to changes while loosely coupled organizations are more flexible. Because of this relationship, coupling becomes an important aspect of organizational linkages.

Thus, organizations must relate to their environments in order to continue as viable entities. Environmental linkages may take many roles: boundary maintenance, boundary spanning, control of conflict and aid in strategic decision-

making. The following discussion summarizes the roles of environmental linkages.

Boundary maintenance occurs when organizations attempt to control uncertainty by placing boundaries around those activities that are crucial for their continued existence (Thompson, 1967). Thus, the argument is made that boundary maintenance is crucial for organizational survival. Environmental linkages provide the necessary information for organizations to perform boundary maintenance (Fennell and Alexander, 1987). These linkages define the domain in which the organization exists. They filter information provided to the technical core and thus can affect the decision-making process (Perrow, 1986). Finally, they can control the membership of the technical core and thereby the make-up and activities of the organization's micro environment.

Boundary spanning is closely related to the concept of boundary maintenance. All organizations must fight the natural entropy of the environment and its associated problems. An organization protects itself against this natural decay by expanding, adapting and filling voids in its environment. This adaptation strategy is crucial to the organization's ability to survive (Leventhal, 1991). Since organizations depend on environmental linkages to provide the information necessary for adaptation, boundary spanning becomes a critical activity for linkage units (Fennell and Alexander, 1987).

Control of conflict with other organizations may be necessary. Aldrich argues that environmental linkages in the form of boundary maintaining systems can be used to control interorganizational conflict (Aldrich, 1971). Depending on the nature of the conflict, the organization can either expand its boundaries to absorb the members of competing organizations or contract its boundaries and avoid the conflict. In either case, the organization is dependent upon boundary maintenance to control the effects of competition and conflict upon its power and authority.

Aid in strategic decision-making may also be gained through environmental linkages. In order to make effective decisions, information about environmental contingencies must reach the organization's decision-making authorities (Leiffer and Delbecq, 1978). There is also evidence that environmental analysis units reduce the tendency of organizations to not act when presented with information that requires action (Lenz and Engledow, 1986). Whether scanning for information to protect against potentially harmful environmental shifts or searching out the opportunity for expansion, environmental linkages provide key information on the external environmental factors which affect an organization's strategic choices.

Interorganizational Relationships

Organizational theory finds its origins in the field of sociology. Relationships between organizations were first studied by Levine and White who suggested that the need for exchange formed the basis for these relationships (Levine and White, 1961). Their theory was based on the exchange of resources. This exchange of resources was the primary reason for interaction among organizations. They proposed that the achievement of specific goals required exchange of resources and hence organizational relations.

Power and dependence was suggested by Emerson as the major reason for organizational relations (Emerson, 1962). Through an imbalance of resources and capabilities, one organization becomes dependent upon another. This dependence aspect gives power to one organization and forces the dependent organization to maintain a relationship. This unbalanced relationship causes the use of power in one of two ways. First, cost reduction behavior makes the demands of the more powerful organization less costly to the dependent organization. The second, balancing operations, involves structural change in an attempt to reduce dependence.

Evan (1965) used role-set theory to create a model based on a "focal organization" surrounded by its "organizational set." This theory suggests that seven attributes of an organization form the basis for its

organizational set: dependence on other organizations, how performance is evaluated, other organizations in the set, concentration of resources (availability) overlap with other organizational sets, goal and value alignment, and personnel attributes. Role-set theory emphasizes the dyadic relationships with the members of the organizational set.

The environment in which an organization acts was defined as the "organizational field" by Warren. He suggested that in order to study organizations they must be seen in the light of the "field" in which they interact (Warren, 1967). Different environments are suggested to cause different behaviors. Each environment promotes differing behavior. Behavior is suggested to be governed by value conflicts over limited resources. Different organizations value different resources unequally. Because all values may not be maximized simultaneously, satisficing occurs. By satisficing the organization achieves less than maximum performance.

The importance of the environment in which an organization acts leads to Weick's "enacted environment." In this theory, the organization creates its own enacted environment and then adapts to it. Through a process of interlocking behaviors, the organization cannot be studied without taking its environment into account. Weick suggests that this process indicates certain tenants of organizational behavior. First, organizations continually

enact and adapt to their environment. Second, control is accomplished through relationships. Third, order does not require goal consensus. Fourth, organizations must balance between flexibility and stability. Finally, organizations attempt to remove ambiguity from the environment. Through this framework of behavior, Weick suggests that organizations are constantly resolving "equivocality" in their enacted environment (Weick, 1969).

The organizational understanding of the environment in which it exists is of paramount importance (Pfeffer and Salancik, 1978). Resource dependency creates this need to interact with the environment. Organizations attempt to achieve goals. The organization must interact with its environment to attain these goals. The interaction results in mutually dependent organizations which come in various types such as interlocking directorates, joint ventures, and negotiated relationships. The major element in these relationships is communication (Salancik, 1988). By opening communication channels, the organization opens itself to influence. However, organizations are willing to bear this cost in order to reduce uncertainty in the environment.

Reasons for forming organizational relationships are many. Organizations form relationships to reduce uncertainty (Weick, 1969). Organizations must also manage and reduce resource dependencies (Pffefer and Salancik,

1978). It is important to examine the conditions which foster the formation of organizational linkages.

Resource exchange is the first major reason that organizations interact. When resources are scarce, linkages are formed in order to facilitate the exchange of resources (Levine and White, 1961). These relationships can often arise in power-dependence relationships (Emerson, 1962). When one organization is dependent upon another due to lack of resources or uncertainty, dependencies arise. The organization controlling uncertainty creates a power-dependence relationship and thus has power.

External forces may also cause organizations to form relations. Often times either government mandate or law may force organizational relationships to form. Or the structure of the environment may mandate a relation due to issues such as political advantage. An organization that needs legitimacy may interact with other organizations to gain that legitimacy. One organization can provide needed public image to another. Cooperation occurs when organizations have similar goals. The factors which motivate cooperation are resource scarcity or mutual needs and purposes (Schoermerhorn, 1975). Given these reasons for forming organizational relationships, the major forms of organizational relationships will be discussed.

Interorganizational relationships take three forms. The first is dyadic, or a simple one to one relationship.

This is seen in Evan's work (1965) as the focal agency is studied in its paired relations with the members of its organizational set. Next is the temporary alliance, a variation on the organizational set. Organizations form these alliances for limited purposes and they are of limited duration. Finally, there are interorganizational networks which are collections of specific organizations formed to attain specific goals. Each of these "forms" of interorganizational relationships has many sub-types. While there are many types of organizational relationships, only the most prominent are listed below.

The first type of organizational relationship is the coordinating agency. Coordinating agencies form specifically to manage the relationships between other organizations. This entity is suggested as created in response to conflicts (Litwak and Hylton, 1962). The coordinating agency forms to manage this conflict. As long as this conflict between organizations exists, the coordinating agency type of relationship will exist.

The joint venture is one of the most common types of organizational relationships. This is a new entity created by two or more organizations. The joint venture is the result of competitive interdependence (Pfeffer and Nowak, 1976). Joint ventures often form between partners in a buyer-seller relationship. Pfeffer and Nowak suggest that

joint ventures exist to reduce the competitive interdependence.

Interlocking directorates exist when individuals serve on two or more boards of directors. This type of relationship is seen to have benefits in the reduction of uncertainty (Schoorman, Bazerman and Atkin, 1981).

Vertical integration ties are formal linkages that are made between suppliers and distributors. The dimensions of vertical integration can be listed as the breadth of the activity, stages of the activity, degree of internal transfers and the type of ownership arrangement (Harrigan, 1984).

Horizontal integration is the acquisition of other firms in the industry. This is also known as mergers and acquisitions. Horizontal integration has the effect of reducing competition and environmental conflict (Pfeffer and Salancik, 1978).

Interorganizational groups are groups whose members have common expectations and concerns and form the group in order to make decisions about these. These groups' behavior is dependent upon the external directives of the members' individual constituencies (Schopler, 1987).

Hybrids are relationships that use resources or governance structures from more than one organization (Borys and Jemison, 1989). Hybrids are an attempt to allow flexibility in the interactions with other organizations.

The preceding discussion shows that organizational relations are the way in which the organization chooses to manage its environment and the methods by which the organization interacts with other organizations. The methods by which organizations choose to interact with other organizations are well studied (Warren, 1967; Weick, 1969; Pfeffer and Salancik 1978). However, with the advent of advanced technologies, organizations are presented with greater flexibility in their relationships through greater interconnectedness (Scott Morton, 1991). Individual roles will be less clear as the boundaries between job categories and tasks are "blurred." Ad hoc teams will be enabled by information technology. All of these changes will cause changes in the structure of the organization.

Management choice and strategic management have long been held as the dominant determinants in structural change (Donaldson, 1987; Scott Morton 1991). It is the convergence or alignment of organizational structure, management process, roles and technology that drives this adaptation (Scott Morton, 1991). This framework suggests that management process is a driving force for change within the organization. Through management process, structure, strategy, people and technology can be modified and adapted (Scott Morton, 1991). These components, in turn, can change the management process. This framework is presented as the

"MIT 90s Framework" in Scott Morton's (ed.) The Corporation of the 1990s.

The MIT 90s Framework clearly suggests that the virtual organization will be a major factor in the new structure of organizations. This framework presents ad hoc teams as one of the important factors in organizational structures. These ad hoc teams can be described in the definition of the virtual organization: the virtual organization is an ad hoc, temporary grouping of individuals with diverse abilities and responsibilities. The purpose of the virtual organization is to respond to task requirements that are not specifically delineated in the organizational charts of an organization (Mackenzie, 1986a; Mackenzie, 1986b).

The framework also dictates the "blurring" of traditional organizational chart structures in favor of increased interconnectivity and interdependence (Scott Morton, 1991). This again suggests that the virtual position will be a major factor in the adapting structure of organizations. In the traditional company, the boundaries and responsibilities are clearly delineated and are an integral part of the organization's structure. Organizational position and hierarchy clearly delineate responsibilities and authority. This organizational structure tends to be rigid and inflexible (Mintzberg, 1983). The requirement to respond to a dynamic environment has blurred these areas of responsibility and authority.

The roles played and the power structure of the organization are clearly affected by the existence of an ad hoc team or virtual organization (Scott Morton, 1991; Mackenzie, 1986a; Mackenzie, 1986b).

While the components of the MIT 90s Framework are all interconnected, a conceptual model that suggests causality is needed for this study. This model is presented at the end of the chapter and suggests that the virtual organization should be considered as an alternative method by which organizations relate to one another.

Virtual Organizations

As suggested in the previous section, the virtual organization is a relatively new form of organizational relationship. While some research has been performed on the effects of the virtual organization (Mackenzie, 1986a; Mackenzie 1986b; Larson 1992), the organizational phenomena that promote this form of linkage have been largely ignored. The virtual organization has been treated as either existing or not existing (Mackenzie, 1986; Mowshowitz, 1992). No measure of strength of the virtual organization or its antecedents has been devised.

The virtual organization or position is a temporary network of independent departments, companies, or people linked together to share skills, costs, and resources. The virtual organization is formed to fill a void where tasks

arise that are not covered by either of the parent organizations' fixed organizational structures. The virtual organization is a "natural phenomena which forms to cope with environmental and internal changes" (Mackenzie, 1986a, Mackenzie, 1986b). The virtual organization forms between two departments of a single organization or between two independent organizations. Central to the idea of the virtual organization is the formal or informal network that forms between the parent organizations.

The virtual organization has been shown to provide certain efficiencies in the areas of innovation and flexibility (Mackenzie, 1986a, Pennings and Harianto, 1992a). In fact, the propensity to network through such organizations has been shown to be the prime predictor of innovation (Pennings and Harianto, 1992b). Because of their ability to respond to situations without the encumbrance of organizational inertia, these forms of networked relationships are more flexible and adaptable than more traditional organizational designs (Larson, 1992).

The virtual organization can be said to be similar to a matrix structure because each membership is based on project or task, yet the phenomenon of the virtual organization remains unique. The differences between the two structures are important to note.

The matrix structure takes two major forms: the permanent matrix and the shifting matrix (Mintzberg, 1979).

In each of these forms, the membership of the work group is based on the project or task at hand, however, in the permanent form, as indicated by its name, the membership is unchanging. The shifting form allows for flexibility in membership as projects change. The first major difference in these forms and the virtual organization lies in regulation and clarity of reporting structures. In both cases of the matrix structure, the hierarchical structure of the interdependencies is clearly delineated (Mintzberg, 1979). In the virtual organization, the clarity of the reporting structures is blurred. The next major difference is that for each of the matrix structures, the membership of the work group is permanent for the life of the project. Work groups are defined based on projected tasks and remain static based on the task (Hodge and Anthony, 1991). The membership of the virtual organization may be in flux during the life of the project (Mackenzie, 1986a).

Mackenzie makes the distinction between regulated and unregulated virtual positions. Regulated virtual positions are those that have set memberships and are formally recognized by the organizations. Regulated virtual organizations are the closest in nature to the matrix structure. Non-regulated virtual positions are "interwoven into the normal organizational architecture in haphazard and idiosyncratic, confusing and often illegal ways" (Mackenzie, 1986a). The degree to which the virtual organization is

regulated, in the sense that its decision-making authority is pre-determined by the parent organizations, is a determining factor in the effect the virtual organization has on the traditional allegiance structure of its members. Membership in the virtual organization will create non-traditional commitment structures. This non-traditional commitment is called member allegiance and is a combination of the two competing models of organizational commitment. Thus, while similar to the matrix structure, the virtual organization is a unique phenomenon unto itself.

Thus, the virtual organization has been studied as regulated or non-regulated. But what determines the strength of the virtual organization? A measurement of the strength of the virtual organization is a central goal of this research. The strength of the virtual organization is seen to be a combination of the climate of the virtual organization and the allegiance of its members. Both architecture of and member allegiance of the virtual organization are influenced by the architecture of the parent organization and the nature of the relationship between the virtual organization and the parent organization.

Organizational Architecture

The organizational architecture of any entity is defined by its structure and attitudes toward control

(Nadler, Gerstein, Shaw and Associates, 1992). This architecture is described in the following sections.

Organizational Design

Organizational design is the decisions and actions that management takes that result in the organizational structure (Willmott, 1981). Organizational design is the sum total of the ways in which the organization divides its labor into distinct tasks and then achieves coordination among them (Mintzberg, 1983). It is also the generic label attached to how an organization adapts itself to change (Mackenzie, 1986a). Organizational design is the continuing cycle of adapting goals and strategies, arranging and maintaining the organizational technology to implement them, and producing desired results in the face of changing environments while the organization continues to function.

Organizational design is most commonly seen as four major decisions: division of labor (specialization), authority (delegation), basis of departmentalization, and span of control. Each is discussed below.

Division of labor concerns itself with the specific activities of the workers. To what extent are the jobs specialized? Managers must divide jobs into specific tasks and activities. Specialization of labor has two major advantages: ease of replacement and ease of proficiency. If the job is highly specialized, a worker can be replaced more easily because less training is required for the

replacement. Likewise, the less tasks involved in a specific job, the more proficient the worker may become. However, more specialized work forces may lose sight of the overall job and become less satisfied (Aiken, Bacharach, and French, 1980). Thus the first decision in organizational design is the extent to which the labor should be specialized (Gibson, Ivancevich and Donnelly, 1988).

The manager must also determine the level of authority to be delegated within the organization. Authority is the right of individuals to make decisions without the approval of higher managers (Mackenzie, 1986a; Gibson, et al, 1988). The advantages and disadvantages of the delegation of authority are many; a few are discussed here. High delegation of authority encourages the development of managers, fosters a competitive environment within the organization and allows for more autonomy by the lower levels. All of this increases satisfaction of the lower levels of the organization (Gibson, et al, 1988). The benefits, however, do not come without their associated costs. First, managers must be trained to handle the added authority. Additionally, many managers are hesitant to give up this authority and lose satisfaction. Finally, the administrative cost of tracking the decisions made at lower levels increases.

The next organizational design decision made by managers is that of departmentalization.

Departmentalization is the process of dividing jobs among the different sections of the organization. Departmentalization may be by function, territory, product, or customer (Burns and Stalker, 1961). Departmentalization by function is combining all like jobs together into one department that covers that function; the principle advantage of this is increased efficiency. Territorial departmentalization is based on geographic areas. Product departmentalization separates jobs on the basis of products created; this allows personnel to develop expertise for a product, or family of products. Customer departmentalization separates jobs on the basis of customers or clients, allowing for the creation of more personalized client relationships (Robbins, 1993).

The final decision in organizational design is that of span of control. Span of control is the decision on the number of jobs over which a single manager can exercise control. This decision is affected by the number of interpersonal relationships that are required by the job (Gibson et al, 1988; Robbins, 1993). Three dimensions dictate span of control: required contacts, specialization and ability to communicate. Required contact is the number of actual contacts between the manager and subordinate that are required to perform the job. Specialization affects the manager's ability to understand the nature of the work of his subordinates. Finally, the ability to communicate will

enable the manager to control more jobs. This ability to communicate is facilitated by technology (Scott Morton, 1991).

These four decisions, specialization, delegation of authority, departmentalization and span of control will lead to the organizational structure. The organizational structure will dictate the level of control exerted by the managers over the organization. This level of control is divided into two dimensions: centralization and formalization.

Attitude Towards Control

The second determinant of organizational architecture is attitude towards control. As stated above, this is divided into centralization and formalization. Each is discussed below.

Centralization is the level at which the decision-making authority resides within the organizational hierarchy (Fredrickson, 84; Miller, 87). This is the concept of delegation of authority among the differing levels of the organizational structure. Typically centralization is separated into decision-making authority and control. The more decision-making authority that is delegated, the less centralization. Likewise, more control exerted over subordinate organizations indicates more centralization.

Formalization is the extent to which the job requirements and processes are specifically written down and

imposed upon the worker (Fredrickson, 1986; Miller 1987). A highly formalized organization would have rules and regulations available for individuals to dictate their actions; standard operating procedures, regulatory directives and policy statements would be prevalent. Formalization is also manifested in specialization, delegation of authority, the use of functional departments, and spans of control. High specialization will lead to higher formalization. As tasks become more specialized, rules and regulations become easier to write and enforce. High delegation of authority will create the need for more control and thus more formalization. Departmentalization allows for specialized rules and regulations to form and thus more formalization. Finally, wide spans of control encourage managers to require written rules and regulations in order to maintain control (Blackburn, 1982).

Thus, it is seen that the organizational architecture is made up of organizational structure and organizational attitudes towards control. Both the organizational architecture of the parent organization and the virtual organization will have an affect on the strength of the virtual organization. As stated above, the combination of organizational architecture and member allegiance will determine the strength of the virtual organization.

Nature of the Relationship Between the Virtual Organization and the Parent Organization

The nature of the relationship between the virtual organization and the parent organization is defined by the organizational power retained at the level of the parent organization. The levels of formal supervision and reporting required by the parent organization and the power retained at that level will influence both the climate of the virtual organization and member allegiance.

Organizational power retained by the parent organization will affect both member allegiance of and the climate of the virtual organization. This retained influence will suggest the level of control or regulation imposed upon the organization by management. This level of control will restrict or foster the formation of the virtual organization.

Power has been defined in a number of ways throughout the literature (Dahl, 1957; French and Raven, 1959; Emerson, 1962). Generically, power can be defined as the ability of entity A to influence entity B in such a way that entity B acts in the desired manner of entity A. Therefor influence is the result of power. This distinction between power and influence has been thoroughly studied (Falbe and Yukl, 1992; Yukl and Falbe, 1990, French and Raven 1959). Likewise, in the organizational setting, the sources of power and the bases of power have been well documented (Hinnings, Hickson,

and Pennings, 1974; Pfeffer, 1981; Astley and Sachdeva, 1984). However, the effect of the presence of a virtual organization on these sources of power has not been studied.

Early studies of power reveal the sources of power to be the five category classification of French and Raven: coercive, reward, expert, legitimate, and referent (French and Raven, 1959). Coercive power depends on fear of retribution. Reward power is based on the ability to provide things of value to others (things such as money, promotions, favorable work evaluations). Expert power derives from unique capabilities or information controlled by an organization. Legitimate power is based in the authority granted to a legitimate position. Finally, referent power develops out of the esteem others hold for a person. While essentially centered on the individual, this classification builds the foundation for further study of organizational power.

Modified for the organizational setting, the sources of power and the bases of power can be separated. Sources of power are control of resources, consensus or solidarity, and control of information (Pfeffer, 1981). The bases of power are coercive power, reward power, persuasive power and knowledge power (Bacharach and Lawler, 1980). A source is differentiated from a base of power in that a base of power is how the organization wields power, while a source of power is what gives the power-holder its base of power.

Bases of power are based on the idea of interdependencies (Pfeffer, 1981; Mackenzie, 1986b). If entity A possesses anything that entity B requires and entity A alone controls this thing, then entity A has power over entity B (Emerson, 1961). Both the bases of power and the sources of power require a dependence relationship. As stated above, the bases of power are coercive power, reward power, persuasive power and knowledge power. Coercive power is based in threat. There is a fear that retaliation will result if certain actions are not taken. Reward power is the opposite of coercive power; action is caused by an expectation of positive benefits. Persuasive power is based on the control of symbolic rewards such as status. Finally, knowledge power is access to information that is unavailable from other sources (Robbins, 1993). The base, knowledge power, overlaps with the source, control of information.

The sources of power are control of resources, solidarity (or consensus), and control of information. Sources of power also require the existence of a dependency to cause actual influence (Pfeffer, 1981, Mackenzie, 1986b). Control of resources is the ability to parcel out necessary and scarce resources among competing recipients (Pfeffer, 1981). Solidarity is the ability to present a unified position in the decision-making arena. The ability to achieve consensus leads to greater influence (Pfeffer and Moore, 1980). Finally, control of information is access to

specific knowledge or control over the decision-making process through control of information about the alternative choices of action (Pfeffer, 1981; Lucas, 84; Heimer, 1985).

While the bases of power will suggest management control, this control is embodied through the levels of formal supervision and reporting required by management (Pfeffer, 1981). Thus, these control measures and the sources of power, control of resources, and control of information will affect both the member allegiance and the climate of the virtual organization.

Member Allegiance

Member allegiance is the first factor that affects the strength of the virtual organization. Member allegiance is seen as a measure of organizational commitment. The member is either committed to the parent organization or to the virtual organization. While it is possible for an individual to be committed to both the virtual organization and the parent organization, the commitment will be at varying degrees. Commitment to the virtual organization can be seen as commitment to the task. A discussion of organizational commitment is presented below.

Organizational Commitment

Organizational commitment has been conceptualized and measured in many ways. Many studies have focused on the link between commitment and turnover (Clegg, 1983; Mowday,

Porter and Steers, 1982). That is to say that members who are more committed to the organization are less likely to leave. However, more important to this study are the behaviors and performance effects caused by commitment.

Organizational commitment has been conceptualized in many different ways, but was first conceptualized in the notion of "side-bets" (Becker, 1960). Becker's side-bets are factors that cause an employee to be tied to his job. These factors include such things as pension plans, salaries and other personal and financial issues. The major thrust of the theory was that if enough of these factors build up it becomes too costly, in a personal or financial sense, for the employee to consider leaving. Similar to this work are the notions of calculative commitment and compliance behaviors. This suggests that organizational members participate because of benefits they expect to receive (Kanter, 1968).

Affective (or emotional) commitment refers to an individual's internalization of the organization's goals and values. This has been called internalization (Kelman, 1958) or moral involvement (Etzioni, 1961). This is to say that an individual's commitment to an organization consists of the individual's acceptance of organizational values and goals, willingness to exert effort to reach those goals and willingness to remain with the organization (Porter, Steers, Mowday and Boulian, 1974).

A third aspect of commitment is seen as normative or obligatory commitment (Etzioni, 1961). Intense feelings of obligation and loyalty cause member behaviors in this case. Feelings of general obligation to the organization characterize normative commitment (Meyer and Allen, 1991). Normative commitment can be the result of familial commitment prior to organizational entry or to organizational socialization after organizational entry (Weiner, 1982). More recently, normative commitment has been seen as the representation of attitudes of loyalty and obligation to the organization (Allen and Meyer, 1990).

Finally, identification is the fourth construct found in the commitment literature. Identification is the individual's desire to be affiliated with some organization (O'Reilly and Chatman, 1986).

The first model of organizational commitment represents the construct as the individual's psychological attachment to an organization (O'Reilly and Chatman, 1986). This model represents the commitment with three constructs: compliance, internalization, and identification. Compliance is the individual's behavior that is undertaken in expectation of rewards. Internalization is the match between the individual's own goals and those of the organization. Identification is the individual's desire to be attached to this organization.

The second model also proposes three factors of commitment. These three factors are affective commitment, normative commitment and continuance commitment (Allen and Meyer, 1990, Meyer and Allen, 1991). Affective commitment is the individual's desire. This is the individual's level of personal involvement in the organization. The construct includes both emotional attachment to and identification with the organization. Normative commitment is the individual's obligation. Feelings of responsibility and debt to the organization cause the individual's behavior (Weiner and Vardi, 1980). Continuance commitment is the individual's need. The individual's behavior is driven by avoidance of the cost associated with other behaviors. The individual remains with the organization because it is too costly to leave. This is very similar to calculative attachment (Etzioni, 1961). These three constructs are distinct, but not mutually exclusive. That is to say they may coexist simultaneously within an individual (Meyer and Allen, 1991).

These two models show some striking similarities.

1. Affective commitment sees the individual as involved with the organization on a deep level. This is very similar to internalization whereby the individual makes the organizational goals his own. These two constructs seem to represent very similar psychological states.

2. Normative commitment is the individual's obligation to the organization, while identification is the individual's desire to be associated with the organization. While not an exact match, these two constructs appear to represent converse ideas. Normative commitment being the negative responsibility to stay with an organization while identification is the positive desire to stay with an organization.

3. Continuance commitment is the individual's avoidance of the cost associated with non-compliant behavior, while compliance is behavior that the individual affects in expectation of reward. Again, this is not an exact match but the two constructs appear to represent the positive and negative aspects of reward and cost due to behavior.

Organizational commitment is well studied conceptually. While all of these constructs are not proven empirically, there have been tests of their veracity (Chatman and O'Reilly, 1986; Caldwell, Chatman and O'Reilly, 1990; Meyer, Allen and Gellatly, 1991). As outlined above, the two models overlap considerably and measurements of the constructs should represent organizational commitment. Through the measurement of these constructs an individual's attachment to the organization should be apparent and hypotheses about behavior may be made.

The Conceptual Model

From the preceding discussion, the model for the effects of the virtual organization emerges. This model is presented in figure 2-1 and shows the relationships between the antecedents of the strength of the virtual organization.

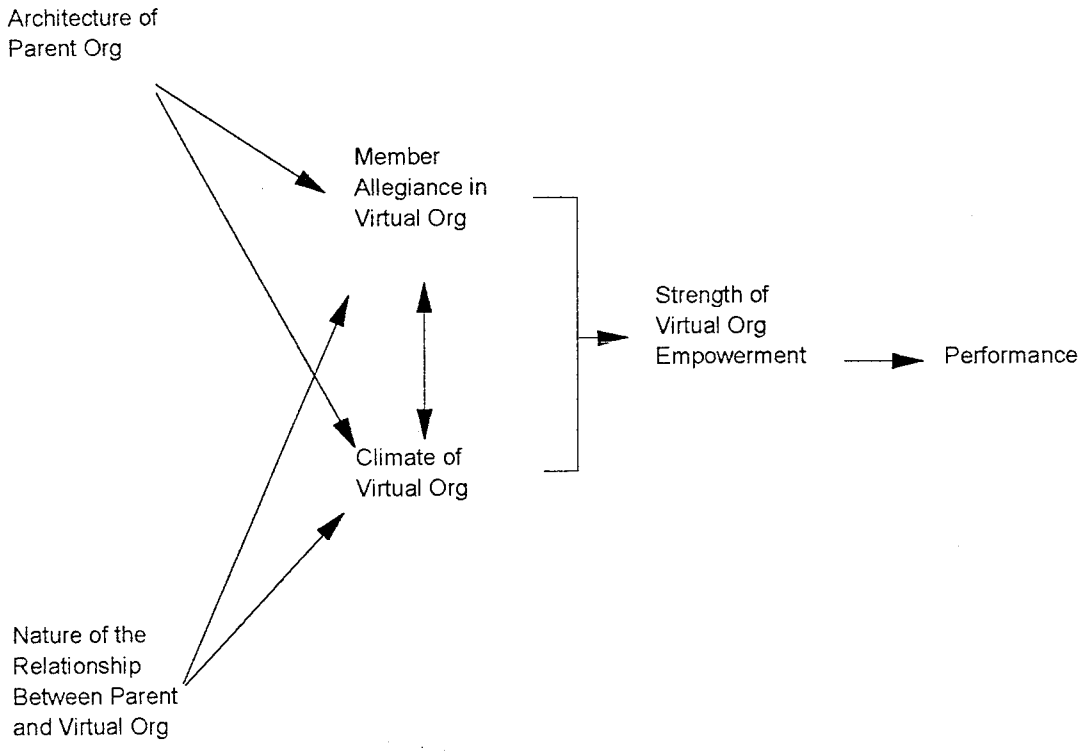

Figure 2-1
Conceptual Model

The model indicates that the architecture of the parent organization influences both the member allegiance of and climate of the virtual organization. Likewise, the nature

of the relationship between the virtual organization and the parent organization influences both the member allegiance of and climate of the virtual organization. In turn, member allegiance and climate of the virtual organization interact to influence the strength of the virtual organization. Finally, the strength of the virtual organization influences performance.

In the following chapter, this model is expanded into a research model. Each construct is defined and discussed in detail. By studying the proposed model, the research questions listed in chapter 1 can be answered.

CHAPTER 3

RESEARCH MODEL

Introduction

This chapter will present the research model in detail. Using the theoretical framework presented in chapter two, the research model will be presented and described in detail. This chapter will begin with a description of the model. The model will be presented. Each construct of the model will be defined and discussed in detail. Finally, hypotheses about the model will be presented. This research model will serve as the basis for the research design presented in chapter four.

The Research Model

Organizations relate to each other for many reasons and through many different conduits (Levine and White 1961; Weick, 1969). Many traditional model methods of interorganizational relationships have been well studied (Pfeffer and Nowak, 1976; Schoorman, et. al., 1981; Harrigan, 1984; Pfeffer and Salancik, 1978; Schopler, 1987; Borys and Jemison, 1989). However, the new framework of

organizational change suggests that traditional organizational structures and ties will be superseded by increased interconnectivity and interdependence (Scott Morton, 1991).

In chapter two, the model was introduced. The model suggests that characteristics of the parent organization and the nature of the relationship between the virtual organization and the parent organization will influence characteristics of the virtual organization. It is these characteristics of the virtual organization that determine the strength of the virtual organization. Finally, the strength of the virtual organization will have an effect on performance.

The characteristics of the parent organization that will affect the virtual organization are the "organizational architecture of the parent organization" and the "nature of the relationship between the virtual organization and the parent organization." Organizational architecture is represented by organizational structure and attitudes of control by the organization (Nadler, et. al., 1992). Organizational structure has been shown to be related to control (Ouichi, 1977; Ouichi, 1978; Ouichi, 1979). The nature of the relationship between the parent organization and the virtual organization is represented by the power retained by the parent organization and the levels of formal supervision and reporting imposed on the virtual

organization. The sources of power have also been shown to exert influence over other organizations (Falbe and Yukl, 1992; Yukl and Falbe, 1990; Pfeffer, 1981). These two constructs make up parent organizational characteristics and will in turn affect the characteristics of the virtual organization.

The characteristics of the virtual organization will determine the strength of the virtual organization. These characteristics are "member allegiance" and "climate of the virtual organization." The member allegiance is defined by organizational commitment and commitment to the task. Organizational commitment has clearly been shown to affect the effort put forth by individuals (Porter et. al. 1974; Meyer and Allen, 1991; Allen and Meyer, 1990). The climate of the virtual organization is again, the structure of the virtual organization and the imposed control by the parent organization. Both structure and control have been shown to influence behavior (Ouichi, 1977; Ouichi, 1978; Ouichi, 1979). Both of the characteristics are affected by the architecture and power retained by the parent organization.

Mackenzie's (1986b) definition of the virtual organization is based on whether members of the virtual organization are autonomous from the parent organization. By identifying issues of task authority, rules and regulations, and supervision, the virtual organization is identified. By modifying Mackenzie's identifying factors, a

measure of strength can be developed. Thus, strength of the virtual organization is defined by three issues: the freedom to use unique solutions to problems, goal autonomy, and the degree to which individuals feel their performance in the virtual organization will affect their overall performance. First, the extent to which the virtual organization feels free to follow unique scripts to complete tasks defines its empowerment. Next, the degree of goal autonomy of the members of the virtual organization will indicate a strong virtual organization. Finally, the degree to which members of the virtual organization perceive their performance in the virtual organization to affect their formal evaluation will contribute to a definition of strength. The antecedents of strength will be dictated by the characteristics of the virtual organization.

The relationships are shown in figure 3-1. Thus, the model shows that the characteristics of the parent organization will cause the characteristics of the virtual organization. In turn, the characteristics of the virtual organization will define the strength of the virtual organization. Finally, the strength of the virtual organization will affect performance. The relationship between strength and performance is moderated by task complexity.

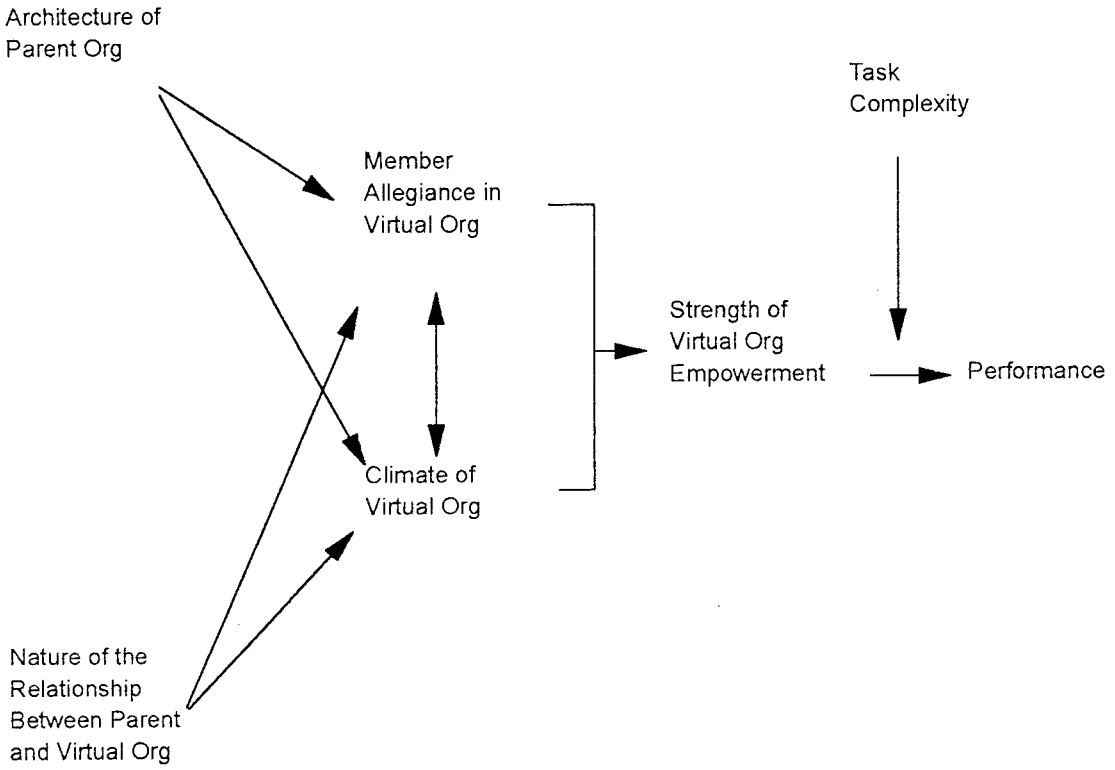

Figure 3-1
Research Model

The individual constructs are discussed in detail in the following section.

Definitions and Relationships

The model contained in figure 3-1 is described in terms of the definitions and relationships of the constructs below.

Performance

Increased performance is the suggested contribution of the virtual organization. The virtual organization has dealt better with tasks involving uncertainty (Mackenzie, 86a; Mackenzie, 86b). In the context of this study, performance will be measured in terms of customer satisfaction. Government contracting procedures are unique in terms of the results expected from the process. For example, the contracting officer is expected to negotiate a "fair and reasonable" price rather than the best possible price (Federal Acquisition Regulation). For reasons such as this, a proxy of customer satisfaction will better address performance. Interviews with contracting officers and program managers reveal four major issues that are important for satisfaction: satisfaction with the process, satisfaction with the speed of task completion, satisfaction with the product, and satisfaction with the cost of the product (Todd, 1993; Hartnett,1994; Routhier,1994; Lundsford, 1993). The involved interviewees all have multiple years experience in the acquisition field with Todd being the Chief of contracts at the Aeronautical Systems Center.

The model shows that performance is affected by the strength of the virtual organization's empowerment. This effect is moderated by task characteristics. That is to say that for tasks of low complexity, the design or existence of

the virtual organization is less important. This will cause no resulting increase in performance due to the strength of the virtual organization's empowerment.

Task Complexity

Task complexity is defined to have three levels: low, moderate and high. These levels are based on standard organizational decision standards. A high complexity task is a "new-task." New-tasks are perceived by decision-makers as requiring new thought and are independent from previous tasks. Large amounts of new information and problem-solving are required in the new-buy. Moderate complexity is represented by the "modified rebuy." While the modified rebuy is based on previous purchases, previous solutions to problems do not fit in this situation. The modified rebuy requires limited problem solving. Buyers have experience with the purchase and will need to seek some additional information to complete the task. Low complexity tasks are "straight rebuys." The straight rebuy is based on the purchase of a previously acquired item. The straight rebuy requires little additional problem solving or information (Hutt and Speh, 1989).

Within each level of low, moderate, and high, the measurements of complexity of time, size, stochasticity, and measurement (Flood and Carson, 1987) are used to further

differentiate complexity. Thus the complexity factor can range across nine different levels.

Strength of the Virtual Organization's Empowerment

The strength of the virtual organization's empowerment is postulated to have three levels: weak, moderate and strong. The existence of these levels will be measured through the organization itself. The following characteristics are a modification of Mackenzie's basic definition of the virtual organization and will measure this strength:

1. The freedom to use unique solutions rather than routinized standard operating procedures. The use of these unique solutions will empower the virtual organization to deal with uncertainty in an ever changing work environment.

2. Autonomy of goals in the virtual organization as compared to the parent organization. By allowing the separation of goals of the virtual organization from those of the parent organization, members are empowered to more effectively complete the task.

3. The perceived effect that performance in the virtual organization has on formal evaluation of its members. If members feel that good performance in the virtual organization will be rewarded even in the face of goal divergence, they will be empowered.

The model shows that the strength of the virtual organization's empowerment is caused by the interaction of

member allegiance and the climate of the virtual organization.

Member Allegiance in the Virtual Organization

Member allegiance is defined as the levels to which the virtual organization's members feel committed to the parent organization or to the virtual organization. As the virtual organization forms to solve specific tasks, the allegiance to the task at hand is a good measure of allegiance to the virtual organization. Allegiance to the parent organization or the virtual organization is represented by standard organizational commitment measures:

1. Affective: deep personal involvement in the organization.
2. Normative: obligations to the organization.
3. Continuance: avoidance of cost or retribution from the organization.

The matrix below visualizes the affect of these allegiance measures on the virtual organization's ability to function separately from the parent organization. This autonomy will be seen in the measures of strength of the virtual organization: use of unique solutions, independence of goals, and perceived affect of performance on evaluation.

Table 3-1
Matrix of Allegiance

PARENT ORGANIZATION COMMITMENT	VIRTUAL ORGANIZATION COMMITMENT: low	VIRTUAL ORGANIZATION COMMITMENT: high
low	neutral	encourages virtual org
high	discourages virtual org	neutral

The relationships in this matrix constitute the postulated operationalization of allegiance and will be examined in the analysis. The cell defined by low virtual organization commitment/high parent organization commitment is believed to restrict the strength of the virtual organization. The cell defined by high virtual organization commitment/low parent organization commitment is suspected to empower the strength of the virtual organization. The cells defined by low virtual organization commitment/low parent organization commitment or high virtual organization commitment/high parent organization commitment are believed to have little affect on the strength of the virtual organization.

Thus, the allegiance of the virtual organization is seen to be caused by the architecture of the parent

organization and the nature of the relationship between the parent organization and the virtual organization. A parent organization with tightly coupled structures will force organizational commitment to itself by its members through similar strict structures. Likewise, a parent organization that retains its power and requires high levels of formal reporting and supervision will also force commitment by its members by withholding resources or information.

Climate of the Virtual Organization

The climate of the virtual organization is determined by the autonomy and potency of employees. Both autonomy, through task and outcome interdependence, and potency affect task effectiveness (Shea and Guzzo, 1987). Autonomy is the extent to which members feel free to perform their tasks. Potency is the belief by members that the group can be effective (Shea and Guzzo, 1987).

Climate of the virtual organization can be restrictive or non-restrictive. A restrictive architecture in the virtual organization is postulated to reduce the strength of empowerment of the virtual organization. A non-restrictive architecture would increase that empowerment.

Climate of the virtual organization is seen in the model as caused by architecture of the parent organization and power retained by the parent organization. A parent organization with a restrictive architecture will likely impose a restrictive architecture on the virtual

organization through structural variables. Likewise, a parent organization that retains all power will enforce a restrictive climate on the virtual organization through lack of potency and autonomy.

Architecture of the Parent Organization

Architecture of the parent organization is the design of social and work systems that make up the organization. It is made up of structural variables, centralization, and formalization. Centralization is the level of control and responsibility that is retained by the parent organization. Formalization is the lack of autonomy employees are given to carry out their assigned tasks through strict rules and regulations.

Architecture is measured on a scale of restrictive to non-restrictive. A restrictive architecture would have low empowerment and autonomy of employees, low delegation and span of control, while maintaining high specialization and departmentalization. Likewise, a restrictive architecture would have high centralization and formalization. A non-restrictive architecture would be the converse.

Thus, the level of restrictiveness is seen to influence the strength of empowerment of the virtual organization through its effects on member allegiance and the climate of the virtual organization.

Nature of the Relationship Between the Parent Organization and the Virtual Organization

The nature of the relationship between the parent organization and the virtual organization consists of power residing in the parent organization and the levels of supervision and reporting required by the parent organization. Mackenzie (1986) describes the level of supervision and reporting as determining factors in the existence of the virtual organization. The higher the frequency of required reporting, the less likely the virtual organization is to form. Likewise, high levels of formal supervision will discourage the existence of the virtual organization.

The sources of power are control of resources, control of information and solidarity, while the bases of power are coercive power (threat of retribution), reward power (offer of reward), persuasive power (ability to persuade), and knowledge power (legitimate expertise). These will be measured to the extent that the use of power in the parent organization is used to maintain control of the employees. Strict retention of power forces commitment to the organizational structures and causes allegiance to the organization.

The nature of this relationship can be said to be tightly coupled or loosely coupled. High levels of retained power, formal supervision and formal reporting indicate a

tightly coupled relationship between the virtual organization and parent organization. The converse is true of a loosely coupled relationship.

Thus, the model reveals that certain organizational structures and power relationships will encourage characteristics of the virtual organization that produce a strong virtual organization. A more detailed view of the model is developed and seen in figure 3-2 below:

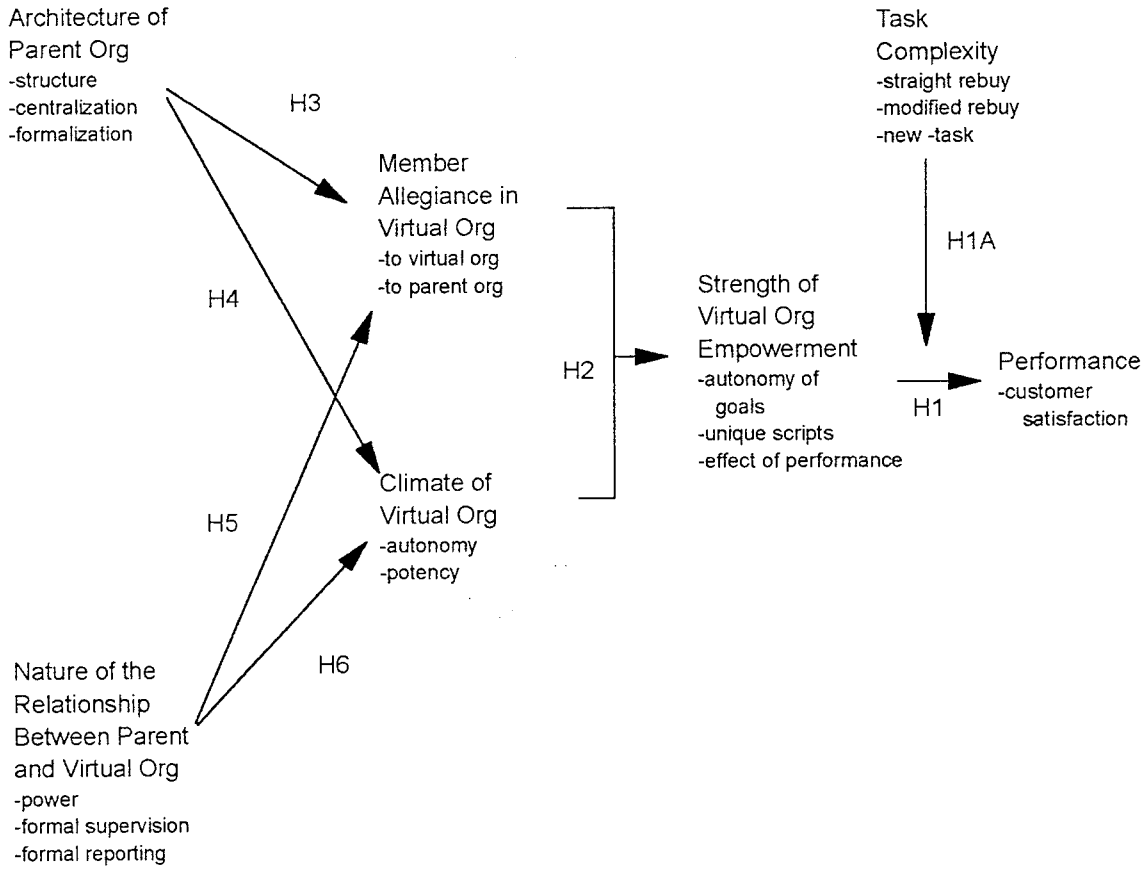

Figure 3-2
Research Model Detail

From the relationships seen in the model, hypotheses may be formulated. These hypotheses are listed in the next section.

Hypotheses

The following hypotheses are suggested by the research model presented in the previous section.

H1: A virtual organization with strong empowerment will perform better in terms of customer satisfaction than one with weak empowerment.

Virtual organizations with strong empowerment will be free to meet the needs of the task. A strength of the virtual organization is its ability to deal with unique and uncertain situations (Mackenzie, 1986a, Mackenzie, 1986b). If empowerment is weak, the virtual organization will be less able to function.

H1a: This effect will be moderated by task characteristics.

Simplistic tasks will be completed well by most organizational structures. When task complexity is high, the effect of the virtual organization on performance will be greatest.

H2: The interaction of member allegiance of the virtual organization and the climate of the virtual organization will be positively correlated with the strength of the virtual organization.

As the member allegiance of the virtual organization shifts from the parent organization to the task, the members will have more allegiance to the virtual organization. This allegiance combines with the restrictiveness of the climate of the virtual organization to define the strength of the virtual organization's empowerment (see table 1 above).

H3: A restrictive structure in the parent organization will be negatively correlated to high virtual organizational allegiance in members of the virtual organization.

Structure is imposed on the organization as a means of control (Fredrickson, 1986; Miller, 1987). This structure will cause members of the virtual organization to show higher levels of commitment to the parent organization rather than to the virtual organization.

H4: A restrictive structure in the parent organization will be negatively correlated to potency and autonomy in the virtual organization.

Restrictive structure reflects the control strategies of the parent organization (Mintzberg, 83). This structure can be expected to be imposed upon the virtual organization. Through tight coupling, the potency and empowerment of the virtual organization will be reduced.

H5: A tightly coupled relationship between the parent organization and the virtual organization will be negatively correlated to high virtual organizational allegiance in members of the virtual organization.

By retaining power, the parent organization maintains high influence over its sub-parts (Falbe and Yukl, 1992; Yukl and Falbe, 1990). By retaining the power, the parent organization forces commitment to the parent organization. Likewise, the levels of formal reporting and supervision required will influence member allegiance--normative and continuance obligation to the parent organization (Meyer and Allen, 1991). If supervision and reporting levels are high, individuals will be forced into obligations to the parent organization (normative) and be more likely to fear potential consequences of their actions in the virtual organization (continuance).

H6: A tightly coupled relationship between the parent organization and the virtual organization will be negatively correlated to potency and autonomy in the virtual organization.

The levels of potency and autonomy define the climate of the virtual organization. The nature of the relationship between the virtual organization and the parent organization is defined by retained power in the parent organization and the levels of formal supervision and required reporting. Because high levels of retained power indicate influence and control strategies, high levels of retained power will be consistent with tightly coupled relationships. This retained power will reduce the autonomy and potency of the virtual organization. Likewise, high levels of formal

supervision and required reporting will reduce the autonomy and potency of the virtual organization.

Testing these hypotheses provides the contribution that a measurement of the strength or degree of the virtual organization is provided. The antecedents of the strength of the virtual organization are examined. Finally, the relationship of the strength of the virtual organization is related to performance. A detailed plan for the research to test these hypotheses is provided in the following chapter.

CHAPTER 4

METHODOLOGY

Introduction

The purpose of this chapter is to outline the procedures to be used to operationalize, measure and test the model presented in chapter three. First, a plan for the validation of the model is outlined. Next, the data collection methods are described. A detailed description of the sample is presented. Then, in the following sections, each construct in the model is operationalized and the instrumentation used to measure the variables is discussed. The organization will follow from the left-hand side of the model presented in figure 3-2 and proceed to the right. Finally, a section on the planned data analysis is presented. A diagram of the plan for the completion of the research is contained in figure 4-1.

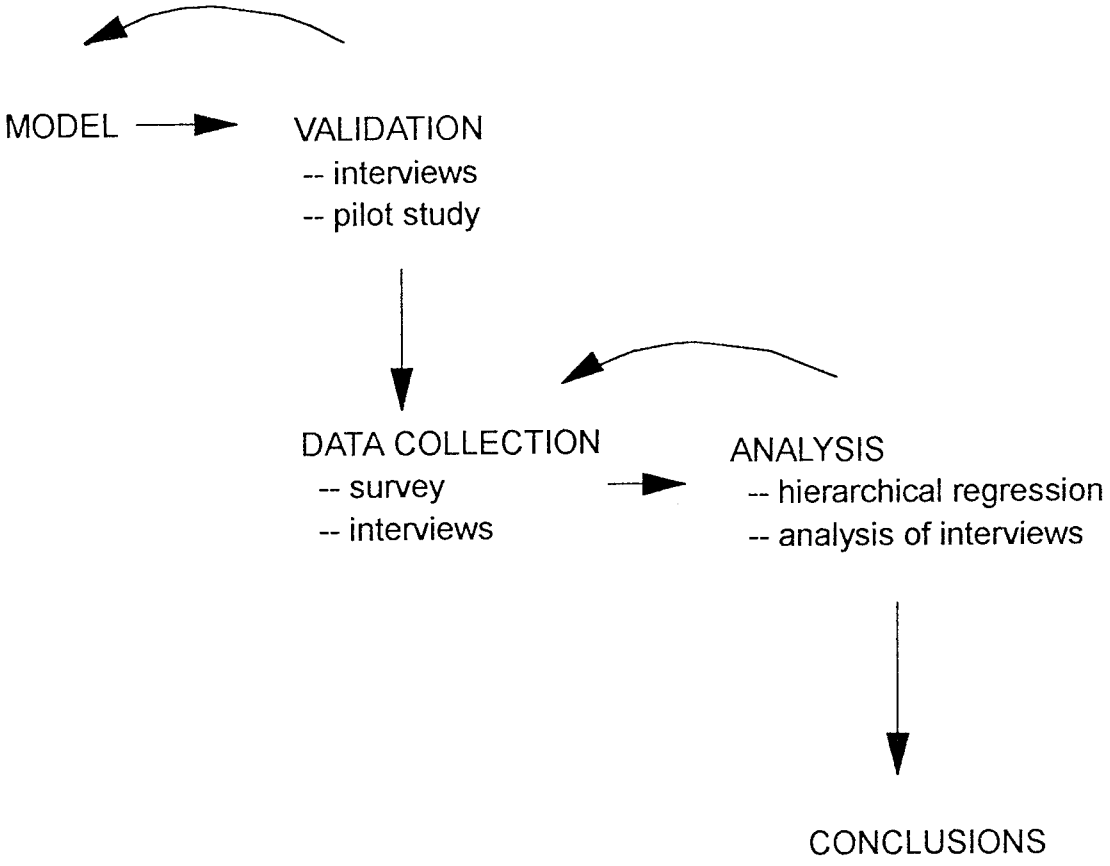

Figure 4-1
Plan of Methodology

As seen in the figure, the plan is iterative in places. If through the validation process, the model is shown to be flawed, the structure of the model will be changed. Again, if as the analysis proceeds, the data collected are shown to be lacking, further data can be collected, or more interviews can be conducted.

Validation

In order to validate the model, the Air Force acquisition team must be verified as a virtual organization. To accomplish this, the definition of a virtual organization is drawn from Mackenzie's work (1986a, 1986b). The virtual organization is defined in terms of the number of organizations that are consulted on, are responsible for, or supervise task processes. Appendix A contains an example of Mackenzie's definition of a virtual organization and the method used to verify that Air Force acquisition teams do indeed represent virtual organizations.

The model will also be validated through a series of telephone interviews with a member of each parent organization making up a single virtual organization. The items in the questionnaire are contained in appendix B. The purpose of these interviews is to verify that the model's constructs represent the organization in the minds of its members.

Finally, a single acquisition team will be given the completed survey (contained in appendix C) to validate the relationships. The pilot study will verify that the survey is indeed measuring the constructs as it is intended. The participants in the pilot study will be interviewed afterwards to verify clarity and content of the survey.

Data Collection

Data collection will be conducted at the Aeronautical Systems Center at Wright-Patterson Air Force Base, Ohio. Appendix C contains the questionnaire that will be distributed to the participants in the study. This section contains a description of the sample and a detailed discussion of the instrumentation. Items that have been developed specifically for this study are contained and discussed in the text of this section.

Sample

The sample will consist of individuals comprising Air Force acquisition teams. These teams are made up of individuals in different organizations within an Air Force System Program Office (SPO). Individuals from all of the organizations subordinate to the SPO will typically comprise an acquisition team. These individuals are also members of subordinate organizations such as engineering, manufacturing or contracts. A complete list may be seen in Figure 4-2. Thus, for purposes of this study, the parent organization is the subordinate organization typically called the "3-letter" organization and the virtual organization is the acquisition team.

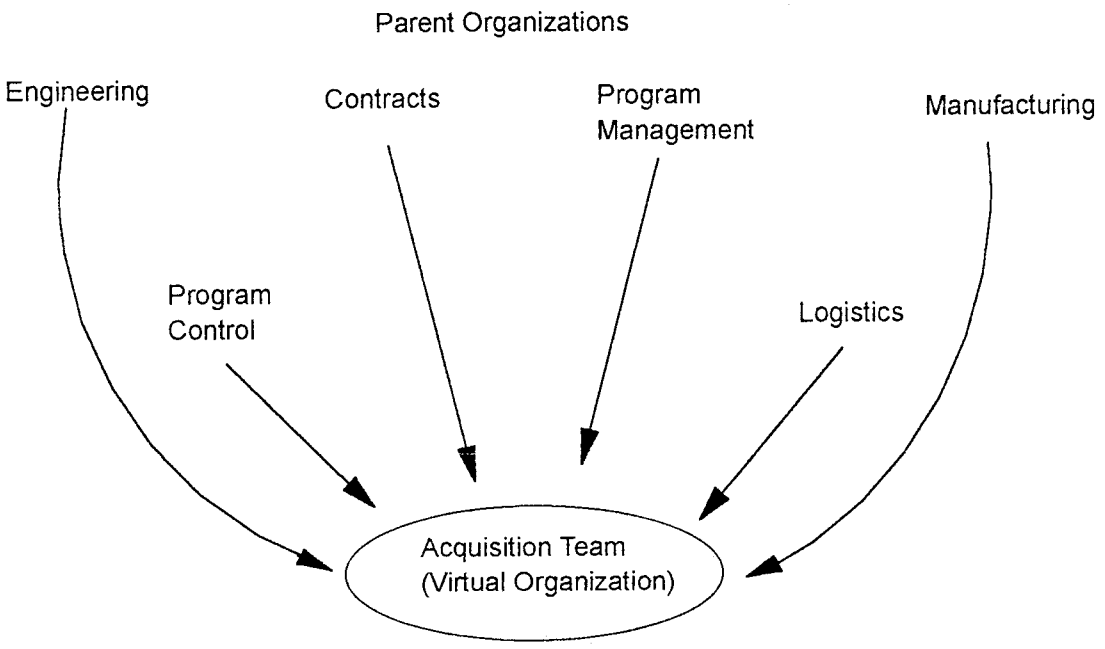

Figure 4-2
Air Force Acquisition

Verification that the Air Force acquisition team is a virtual organization can be seen in appendix A. The five major acquisition tasks are evaluated to verify that the virtual organization exists. This verification is based on Mackenzie's definition of the virtual organization. The virtual organization is defined by the number of different organizations that are responsible for, supervise, or are consulted in the task process (Mackenzie, 1986a).

Thus, the survey instrumentation will be administered to existing Air Force acquisition teams with instructions to direct answers to specific acquisition projects. Questions regarding the parent organization will be directed to the "3-letter" organization. The virtual organization is the

specific acquisition team and questions concerning the virtual organization will be worded accordingly.

The level of analysis for this project is that of an individual acquisition team. Respondents will be instructed to answer questions as they relate to a single acquisition project. As separate teams are formed to complete acquisition projects, this will provide for a level of analysis that is the single acquisition team. The key respondents will be individual members of the SPO on the acquisition team. For certain regression analyses, the individual is the level of analyses in order to maintain theoretical consistency. This is discussed in more detail in the description of the separate analyses. A sample of between 75 and 90 teams is expected. This would represent 10 SPOs with 5-8 teams per SPO reporting. This represents the majority of the active, non-classified SPOs at the Aeronautical Systems Center, with each SPO having approximately 10-15 active acquisition teams. Thus, this sample size should be sufficient to examine the variance in the constructs. Furthermore, as each team is made up of 3-15 members, a total of 200-300 individual surveys should be collected. This should be more than enough to control for individual differences in respondents.

The data collection scheme is summarized in table 4-1.

Table 4-1
Strategy for Data Collection

Variable	Key Respondent	Scale	Dimensions	Literature
Climate of the Parent Organization	Individual Team Members	Likert Scale (Aiken and Hage, 66)	Centralization Formalization	Nadler, '92 Fredrickson, '86 Miller, '87
Nature of the Relationship between the Virtual Organization and the Parent Organization	Individual Team Members	Likert Scale	Power Formal Supervision Formal Reporting	French and Raven, 59 Yukl and Falbe, '90 Falbe and Yukl, '92 Mackenzie, 86
Member Allegiance	Individual Team Members	Two Likert Scales Averaged across teams (Mowday, Steers, and Porter, '79) Dummy Coded per table 3-1	Organizational Commitment	Mowday, Steers, and Porter, 79 Roberts and O'Reilly, '79 Allen and Meyer, '90 Meyer and Allen, '91
Architecture of the Virtual Organization	Individual Team Members	Likert Scale Averaged across teams	Autonomy Potency	Nadler, 92 Shea and Guzzo, '87
Strength of Virtual Organization Empowerment	Individual Team Members	Likert Scale Averaged across teams	Autonomy of Goals Unique Scripts Effect of Performance	Mackenzie, '86

Table 4-1 (Continued)
Strategy for Data Collection

Complexity	Secondary Data	Examination of case Files Interviews with Respondents	New-Task Modified Rebuy Straight Rebuy	Aeronautical Systems Center Contract Procedures Book, '93 Robinson, Farris, and Wind, 1967
Performance	1. Individual Team Members 2. End User Representative	Likert Scale Averaged across teams Likert Scale (individual) Interviews	Speed Process Cost Quality	Interviews with Program Managers, Contracting Officers and End Users

Instrumentation

The following instrumentation is a combination of developed scales and existing scales. The survey may be seen in its entirety in appendix C.

Architecture of the parent organization. The architecture of the parent organization is operationalized as centralization and formalization as it relates to the 3-letter organization. Respondents will be directed through the nature of the question to provide information about the single parent organization, the 3-letter organization. Responses will be aggregated in order to obtain a score for the 3-letter organization.

The instrumentation used to measure this construct was obtained from Aiken and Hage (1966). These measures have been well tested (Dunham and Blackburn, 1979; Glisson and Martin, 1980). Centralization is a two dimensional construct made up of "hierarchy of authority" and "participation in decision-making." Formalization is also a two dimensional construct consisting of "codification" and "rule observation." The constructs of centralization and formalization encompass structure and architecture as tested by this model. High levels of centralization and formalization will indicate a restrictive architecture. The items may be seen in appendix C, part II.

Nature of the relationship between the virtual organization and the parent organization. The nature of the relationship between the virtual organization and the parent organization is seen as the amount of control that the parent organization exerts over the virtual organization through power, reporting and supervision. Instrumentation was developed using a Likert-type scale to measure these issues. Power is operationalized as the parent organization's control over resources and information. The questions are based on the frequency of intrusion by the parent organization. The items on the scale are Likert-type from one to seven with 1 = "Every Day" (ED), 4 = "sometimes" (S), and 7 = "Never" (N). The items can be seen in appendix C, part II.

As indicated by the coding scheme, a high score on this scale should indicate less control exerted by the parent organization and thus a loosely coupled relationship between the virtual organization and the parent organization. A loosely coupled relationship should indicate a non-restrictive architecture in the virtual organization and allegiance to the virtual organization.

Member allegiance in the virtual organization. This construct is seen as allegiance being to the virtual organization or to the parent organization. The relationship and its effect on the strength of the virtual organization can be seen in table 3-1 found in chapter 3.

The measures of allegiance will follow that operationalization scheme. The items used to measure this construct are well tested (Roberts and O'Reilly, 1979; Mowday, Steers and Porter, 1979). The items have been slightly modified in order to put them into the context of the acquisition team or the 3-letter organization. The respondent is asked to respond to items for both the acquisition team and the 3-letter organization. These items are contained in appendix C, part III.

Climate of the virtual organization. Architecture in the virtual organization is a combination of the autonomy of members and perceived potency of the members. Autonomy will lead to flexible non-restrictive architecture (Nadler, 1992). Non-restrictive architecture is also indicated by potency. Potency is a major factor in group success (Shea and Guzzo, 1987). The items on the scale are Likert-type from one to seven with 1 = "every day" (ED), 4 = "sometimes" (S), and 7 = "never" (N). The items developed to test can be seen in appendix C, part III.

A high score on this scale would indicate a non-restrictive architecture in the virtual organization. This non-restrictive architecture would indicate a high strength of virtual organization empowerment.

Strength of the virtual organization. Strength of the virtual organization is operationalized as the degree to which the members feel free to use unique solutions, the

amount of goal autonomy of the virtual organization and the extent to which members of the virtual organization perceive their performance to affect their overall evaluation. These factors are modified from Mackenzie's (1986a, 1986b) definition of the virtual organization to emphasize the advantages of the virtual organization and Shea and Guzzo's (1987) work on team effectiveness. The items on the scale are Likert-type from one to seven with 1 = "strongly disagree" (SD), 4 = "Neutral" (N), and 7 = "strongly agree" (SA). The full text of the items may be seen in appendix C, part III. A high score on this scale will indicate strong virtual organization empowerment.

Task complexity. Task complexity is operationalized by examination of the contract files. The tasks will be grouped into three categories corresponding to low, moderate and high task complexity. The specific tasks that fall into these categories are derived from the Aeronautical Systems Center Contracting Procedures Book (May 1993). Low task complexity (straight rebuy) will consist of simple change orders and funding actions. These are typically simplistic tasks that require effort, but little new information or decision-making. Moderate complexity (modified rebuys) consist of "new work" change orders. These are more complex tasks requiring some information and new decision-making. Finally, high complexity (new tasks) are new acquisitions

requiring new contracts. This is the most complex of acquisition tasks.

Performance. Performance is operationalized as satisfaction with the timeliness, price, quality and process of the acquisition. These four factors emerged from interviews with program managers, contracting officers, and end users of the product (Todd, 1993; Routhier, 1994; Hartnett, 1994; Lundsford, 1993). The items on the scale are Likert-type from one to seven with 1 = ''strongly disagree'' (SD), 4 = ''Neutral'' (N), and 7 = ''strongly agree'' (SA). The text of these items may be seen in appendix C, part IV. A high score on this scale will indicate a high level of performance.

The measurement of this construct is based on a combination of self-reported information and interviews with customers and end-users of the product. Table 4-2 contains data about the respondents. The sum of the scores will be used as the performance score.

Table 4-2
Performance Measure

Respondent	Team Member	Customer	End-User
Method of Response	Self-report (Survey)	Interviews	Interviews
Position	Member of Virtual Org.	Customer of Virtual Org. (Often from same SPO)	Represent Air Force Using Organizations
When Used	All	When Product Stays In-House (85%)	When Product Requires (15%)
Dimensions	Time Cost Process	Time Cost Quality	Time Cost Quality

Analysis

The structure of the model dictates that what is a dependent variable in one instance will be an independent variable in another. Because of this structure, hierarchical regression analysis will be the appropriate method to partition the total variance in the model (Pedhazur, 1982). The moderating variable task complexity will be tested using interaction (multiplicative product) terms in the regression analysis. The results of the hierarchical regression will be verified through follow-up interviews with key respondents. Through a combination of the regression and follow-up analysis, validity for the

model will be achieved. The model will be tested on both the team and the individual level as appropriate. The remainder of the chapter includes a discussion of the individual tests.

Team Level Analysis

A hierarchical regression is appropriate for the team level analysis. The team level analysis will be used for the portion of the model contained in figure 4-3

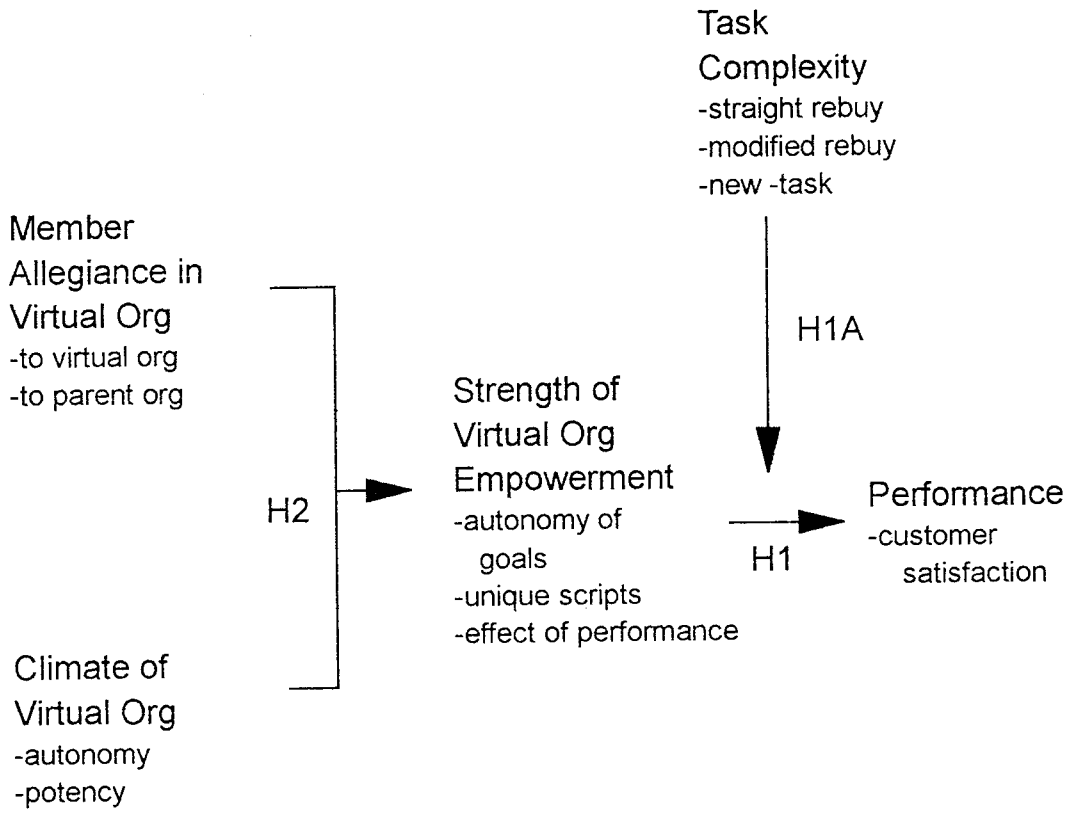

Figure 4-3
Team Level Analysis

This level of analysis is appropriate for this portion of the model because data may be averaged across team members to obtain accurate measurements for these constructs.

A discussion of the separate analyses of the model parts as they relate to the research questions follows. This discussion will start at the right side of the research model.

The hierarchical regression will enter the variables starting at the right hand side of the model. Variables will be entered in three blocks: control, strength, and characteristics of the virtual organization. The results will be summarized in a table substantially like table 4-2 below. The regression coefficients to be obtained are represented by "x's" in this example table. The hypotheses to be tested in each case are in the parentheses. Calculated statistics are represented by "Y's."

Table 4-3
Example Output from Hierarchical Regression Analysis

BLOCK	VARIABLES	BETA 1	BETA 2
Control Variable	Task Complexity	x (H1a)	x
Strength	Strength of Virtual Organization Empowerment		x (H1)
	R-squared	Y	Y
	Change in R-squared	Y	Y
	F	Y	Y
	d.f.	1, n-k-1	1, n-k-1

* The null hypothesis that the regression coefficients are significantly different from zero is tested by calculating the change in R-squared after entering each new block of the regression analysis.

The F-test statistic is calculated with the following formula:

$$F_{blocki} = \frac{\Delta R^2_{blocki}/M_i}{(1 - R^2)/(n - k - 1)}$$

The significance of the F statistic for each block will indicate the significance of the individual coefficients within the block. In the above equation R^2 is from the completed regression (BETA 4 column of the table) and M_i is the number of variables in the block.

The above described hierarchical regression analyses will test the relationships contained in the research model.

Individual Level Analysis

Because the data may not be accurately averaged across teams for either architecture of the parent organization or nature of the relationship between the parent organization and the virtual organization, the portion of the model seen in figure 4-3 will be tested at the individual level of analysis. The individual level of analysis is dictated because individual members of the virtual organization are answering questions about different parent organizations. Any attempt to average these results for a single team score would lack validity due to the measurement of different organizations.

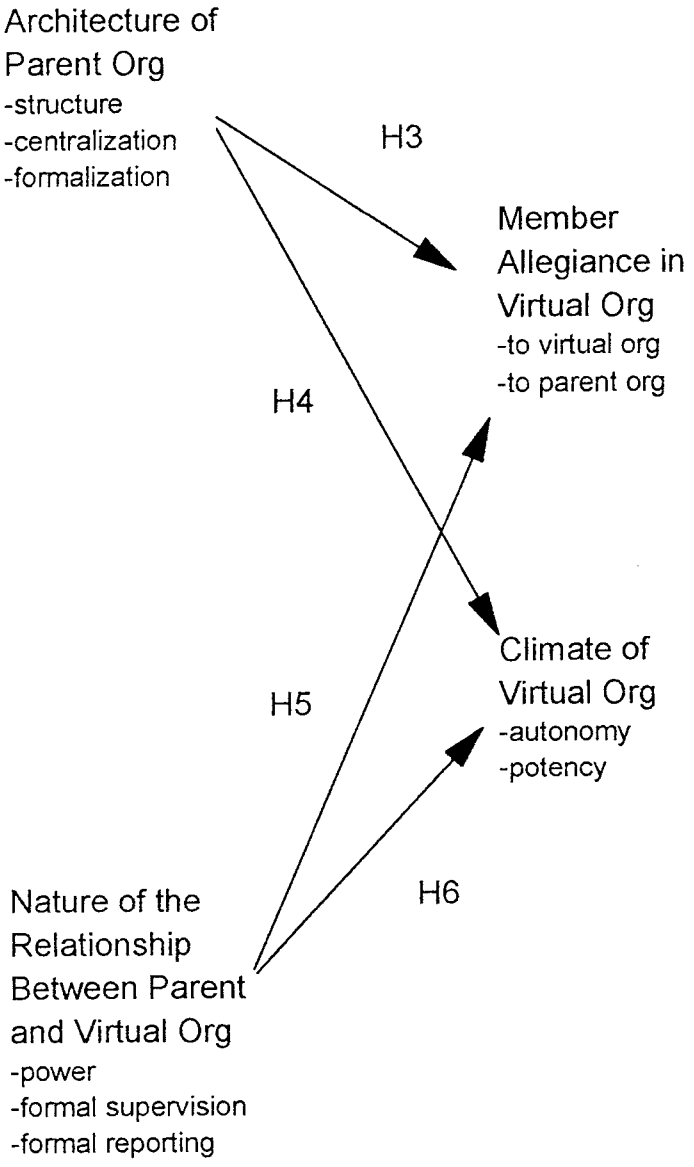

Figure 4-3
Individual Level Analysis

The individual models to test both the team level of analysis and the individual level analysis are contained in the next chapter in table 5-17.

Follow-up Interviews

Qualitative analysis will be used to verify results. Follow up interviews will be conducted with key respondents such as lead contracting officers and primary program managers. These interviews will stress the results revealed in the quantitative analysis:

1. Does the nature of the relationship between the parent and virtual organization affect behaviors or allegiance?
2. Does the structure of the parent organization affect behaviors or allegiance?
3. Does allegiance affect work actions?
4. Do feelings of independence from the parent organization increase your ability to complete tasks?
5. What do you feel increases performance?

By cross checking the results of the analysis, greater validity can be obtained. Finally, unusual findings will be presented to interviewees in order to gain insight into the system.

Summary

The Air Force Acquisition Team is a good example of the virtual organization at work. SPOs regularly depend on the virtual organization to react to the volatile environment of defense acquisition. The above outline strategy to validate and test the research model presented in Chapter 3 will allow for the study of this important phenomenon. The

hierarchical regression analysis proposed will allow the research to properly partition the variance among the variables.

CHAPTER 5

ANALYSIS AND RESULTS

Introduction

The purpose of this chapter is to present the analysis of the data collected on the dynamics of the virtual organization. Development of the instrument is described in the previous chapter. This chapter begins with a section on the pilot study and its results, followed by a section on verification and validation of the data itself. Finally, testing of the research model is discussed in a section containing the details of the regression analysis.

Pilot Study

As described in the previous chapter, the original instrumentation was administered to a group of Air Force acquisition managers (n=17) in order to verify the individual items. After completing the survey, each manager was interviewed by telephone about the content, clarity, and intention of each item using the questions found in Appendix B.

Interviews

The results of the interviews were qualitatively examined to verify the model and instrumentation. Each question will be discussed.

The first question asked was: how does the complexity of the acquisition affect the performance of the acquisition team? Four major issues emerged from the interviews: time pressure, technical issues, customer problems, and size. Each will be discussed in order of importance to the interviewees. Time pressure seemed to be the most important complexity factor involved in the process. There never seemed to be enough time to satisfy the customer. Next, technical issues were seen as hindrances to the process, but only in the sense that they caused delays. Customer problems were mentioned often, but also only in the sense that the customer would change the requirements in mid-stream and delay the process. Therefore, these three issues are considered the same factor of "timeliness." Finally, size was considered an important factor. Further discussion revealed that by size the respondents meant the size of the project, the number of individuals involved, the need for higher approval, and pure complexity of the system being acquired. Therefore, there are questions in the instrumentation to test the factor of "size." The model supports these findings through the moderating variable "task complexity."

The next two questions asked were: a) What 3-letter (second level management organization) and SPO (system program office) factors do you feel affect an acquisition team's performance? and b) What acquisition team factors do you feel affect the acquisition team's performance? The results of this question overwhelmingly support the issues of empowerment, autonomy, and potency for the acquisition team. Team members wanted to feel that the parent organization was there for support but not to interfere. To a lesser extent, the allegiance to the virtual organization was perceived as having both a positive and a negative dimension. Positive in the sense that workers tended to pursue the virtual organization's goals zealously. However, when viewed as a negative these goals were seen to be in conflict with the overall goals of the parent organization. When seen as a negative, respondents were always indicating that this was a problem with another team, not their own. This indicates that there is some competition for resources and support from the parent organizations among acquisition teams. These findings are tested in the structure of the model through the dimension "power retained" in the construct "nature of the relationship between the parent organization and the virtual organization."

The final question asked of the respondents was: Do you feel more empowered to do your job when your allegiance is to the 3-letter organization or to the acquisition team?

Again, the results of this question were somewhat conflicting. Allegiance to the acquisition team was seen as having both a positive and negative dimension. As in the results of the previous question, allegiance was only seen as a negative characteristic in the members of other teams. This supports allegiance as a construct in the model, however, its effects may be different than originally postulated. The actual results will be tested in the regressions that follow. Recall the operationalization scheme for allegiance found in table 3-1. Allegiance is said to encourage or discourage the virtual organization. This is tested in the structure of the model, even in light of these findings.

As described above, each respondent was asked to complete the questionnaire and then was asked about the individual items. The length of the instrument was verified as acceptable with the average time to complete of approximately 12 minutes. The individual questions were edited for clarity and understanding. Finally, individuals were asked if the questionnaire and the model represented the dynamics of the acquisition team and virtual organizations in general. Only one of the 17 respondents suggested that this was a "waste of time." This respondent was generally negative toward the process and was thus discounted in the results. This individual's comments on the clarity of the items themselves were used. The other 16

respondents felt that the model was a good representation of the system. The final instrumentation may be found at Appendix C.

Sampling Procedures

The data was collected at the Aeronautical Systems Center at Wright-Patterson Air Force Base Ohio. This Center is responsible for the acquisition of aircraft for the Air Force. The Center consists of individual buying entities called System Program Offices (SPO). Each SPO is responsible for the purchase of a major aircraft or for the systems attendant to a mission such as reconnaissance. In the terminology of this study, each SPO contains multiple parent organizations (3-letter organizations) and virtual organizations (the acquisition teams).

The instrumentation found in appendix C was distributed to acquisition teams within six of the ten available SPOs at the Center. The available teams were identified by officials within the Center itself. The only restrictions to access within the center was based on the security classification of the projects involved.

Respondents ranged in age from 23 to 63 with 85% being male. The majority of respondents were non-managerial (38.6%) or low-level management (33.3%). Only 25.8% reported being mid-level management and 2.2% reported being upper level management. The majority of respondents (56%)

reported having attained a masters degree, 39.7% reported an undergraduate only while 1.1% reported higher than a masters degree.

Individuals were given verbal instructions by the researcher. Eighty-four teams consisting of 273 individuals responded to the survey. This represents over half of the active teams at the center and will serve as a representative sample of the center as a whole.

Verification and Validation of the Results

The results of the survey were subjected to item analysis to verify the results and then factor analysis in order to validate the results. The sample consists of a total of 273 individuals comprising 84 acquisition teams. Although the level of analysis for this project is the team, the item and factor analysis are performed on individual responses as the individual responses are later combined into team data. A section describing the item analysis and factor analysis follows.

Item analysis

The process of item analysis is performed to verify that the items on the instrumentation accurately ask the intended question and add to the information being obtained. Each scale is subjected to an overall reliability test (Cronbach's Alpha) while each item is subjected to a

discrimination index (does the question accurately discriminate between respondents) and then the Cronbach's Alpha is measured if the item is deleted from the scale.

The following item analysis is based on the scales developed in chapter three to measure the individual constructs of the model. The scales and their items are summarized in table 5-1.

Table 5-1
Summary of Instrumentation

ARCHITECTURE OF THE PARENT ORGANIZATION

Hierarchy of Authority
- decision approval
- decision discouragement
- small matters
- ask boss
- boss approval

Participation in Decision Making
- new staff
- promotions
- new policies
- new programs

Codification
- own boss
- own decisions
- how things are done
- do as please
- own rules

Rule Observation
- employees checked
- constantly watched

NATURE OF RELATIONSHIP

Power Retained
- need resources
- have resources
- have information
- need information
- need assistance
- no assistance

Level of Reporting
- required to report
- progress reports
- up to date
- superiors involved

Level of Supervision
- complete tasks
- results only
- everyday tasks
- regular milestones
- problems

Table 5-1 (cont.)
Summary of Instrumentation

Allegiance
(questions were asked in terms of both the virtual organization and the parent organization)

- great effort
- great organization
- little loyalty
- continue here
- similar values
- pride in organization
- work elsewhere
- inspires best
- leave organization
- glad to be here
- nothing to be gained
- little agreement
- caring
- best organization
- mistake

CLIMATE OF THE VIRTUAL ORGANIZATION

Autonomy
- no interference
- not questioned
- results

Potency
- individual expertise
- resources
- team expertise
- support

STRENGTH OF THE VIRTUAL ORGANIZATION

Autonomy of Goals
- deviate from policy (job)
- adherence to rules

Unique Solutions
- non-standard solutions
- accepted solution
- deviation from solution
- creativity

Effect of Performance
- deviate from policy (performance)
- success vs. rules

Table 5-1 (cont.)
Summary of Instrumentation

PERFORMANCE
Time
too long
delays
Quality
superior quality
Cost
price acceptable
cost too high
Process
fulfilling
successful project
good example

The results of the item analysis for each scale will be discussed in turn. First, the overall coefficient alpha (reliability index) is provided. In general, a coefficient alpha of .6 is considered to be minimally acceptable, while .7 and higher are considered to be good (Nunally, 1976). Analysis of the individual items was based on the discrimination index which should be .3 or higher (Nunally, 1976). The discrimination index describes each individual item's contribution to the scale. Each item, also, was compared to the coefficient alpha for the entire scale if the item was deleted.

Architecture of the parent organization. The results of the reliability and item analysis for the scales measuring the architecture of the parent organization are summarized in table 5-2. The overall coefficient alpha for

the scale was well above the acceptable .6 level at a strong .8667, which indicates that the scale is reliable in measuring the construct.

Table 5-2
Reliability and Item Analysis for Architecture of the Parent Organization

Item	Discrimination Index	Alpha if Item Deleted
decision approval	.6265	.8553
decision discouragement	.6604	.8537
small matters	.6647	.8540
ask boss	.6539	.8544
boss approval	.6696	.8544
new staff	.4133	.8657
promotions	.3290	.8681
new policies	.4370	.8645
new programs	.3914	.8666
own boss	.6905	.8530
own decisions	.5289	.8601
how things are done	.5406	.8597
do as please	.4085	.8655
own rules	.2907	.8705
employees checked	.3350	.8682
constantly watched	.3828	.8663

* coefficient alpha = .8667

Only a single item (own rules), failed the discrimination index (.2907) and only marginally so. Because this scale was a modified version of existing instrumentation (Aiken and Hage, 1966), the item was not deleted. No significant increase in the reliability index (alpha rises to .8705 from .8667) will accrue from deleting items. Thus the entire scale was retained for the factor analysis described in the next section.

Nature of the relationship between the parent organization and the virtual organization. The results of the reliability and item analysis for the scales measuring the nature of the relationship between the two organizations are summarized in table 5-3. The overall coefficient alpha for the scale was above the cut-off of .6 at .7355.

Table 5-3
Reliability and Item Analysis for Nature of the Relationship

Item	Discrimination Index	Alpha if Item Deleted
need resources	.3074	.7240
have resources	.2390	.7306
have information**	.1391	.7395
need information	.2497	.7297
need assistance	.4280	.7120
no assistance	.3388	.7207
required to report	.4914	.7048
progress reports	.4134	.7135
up to date	.4872	.7057
superiors involved	.4532	.7085
complete tasks	.4522	.7075
results only	.3464	.7199
everyday tasks	.4088	.7132
regular milestones**	.0883	.7459
problems	.2266	.7336

* coefficient alpha = .7554 (after deletes)
** item deleted for factor analysis

Only two items, "have information" (.1391) and "regular milestones" (.0883) both failed the discrimination index and raised the overall reliability of the scale if deleted. The items do not significantly discriminate between respondents and by deleting these items the overall reliability of the scale is increased to 7554. Thus these two items were

deleted for purposes of the factor analysis. The actual item for "have information" was: I have sufficient information to complete all acquisition tasks. The information intended to be obtained here was also questioned by the item "need information." Although the item "need information" was reverse coded, it appears that no significant information is lost by deleting have "information." The second deletion "regular milestones" was worded: my superiors become involved in tasks only at regular milestones. The intent of this item was to test superiors involvement in everyday work. Two other items, "everyday tasks" and "problems" also tested this information. Thus, deleting the item should not significantly detract from the information being gathered.

Member allegiance. Member allegiance was measured by asking similar questions based on organizational commitment to the virtual organization and then to the parent organization. The results of the reliability and item analysis for the scale measuring the virtual organization commitment are summarized in table 5-4. The overall coefficient alpha for the scale was a high .9167 well above the acceptable level of .6.

Table 5-4
Reliability and Item Analysis for
Virtual Organization Commitment

Item	Discrimination Index	Alpha if Item Deleted
great effort	.5016	.9098
great organization	.7477	.9014
little loyalty	.2154	.9236
continue here	.3274	.9166
similar values	.6567	.9052
pride in organization	.8394	.8986
work elsewhere	.5385	.9088
inspires best	.7746	.9007
leave organization	.5838	.9073
glad to be here	.7260	.9024
nothing to be gained	.7559	.9010
little agreement	.4535	.9113
caring	.7085	.9036
best organization	.7849	.9004
mistake	.7245	.9026

* coefficient alpha = .9167

Only a single item "little loyalty" failed both the discrimination index and raised the overall reliability of the scale if deleted. However, since this instrumentation was based on an existing and well tested survey (Mowday, Steers, and Porter, 1979), the item was not deleted. By retaining the item, the integrity of the scale is maintained and the measure of commitment can be used to operationalize allegiance.

The results of the reliability and item analysis for the scale measuring the virtual organization commitment are summarized in table 5-5. The overall coefficient alpha for the scale was a high .9206 indicating a reliable measure.

Table 5-5
Reliability and Item Analysis for
Parent Organization Commitment

Item	Discrimination Index	Alpha if Item Deleted
great effort	.5616	.9131
great organization	.7181	.9080
little loyalty	.0864	.9313
continue here	.4215	.9182
similar values	.6174	.9114
pride in organization	.7961	.9057
work elsewhere	.6248	.9111
inspires best	.6854	.9093
leave organization	.7319	.9074
glad to be here	.7266	.9078
nothing to be gained	.7334	.9073
little agreement	.5065	.9174
caring	.7207	.9084
best organization	.8055	.9053
mistake	.7661	.9065

* coefficient alpha = .9206

Again, only the single item "little loyalty" failed both the discrimination index and raised the overall reliability of the scale if deleted. However, since this instrumentation was based on an existing and well tested survey (Mowday, Steers, and Porter, 1979), the item was not deleted. Again, the integrity of the scale is maintained by retaining the item for use in the operationalization of allegiance. These two measures will be used according to the scheme described in table 3-1 in chapter three.

Climate of the virtual organization. The results of the reliability and item analysis for the scale measuring the climate of the virtual organization are summarized in

table 5-6. The overall coefficient alpha for the scale was a strong .7883, well above the .6 cut-off.

Table 5-6
Reliability and Item Analysis for
Climate of the Virtual Organization

Item	Discrimination Index	Alpha if Item Deleted
no interference	.5172	.7618
not questioned	.6157	.7426
results	.4483	.7750
individual expertise	.5010	.7649
resources	.5923	.7464
team expertise	.5574	.7542
support	.3807	.7866

* coefficient alpha = .7883

All items passed both tests and therefore none were deleted. All items will be included in the factor analysis.

Strength of the virtual organization. The results of the reliability and item analysis for the scale measuring the strength of the virtual organization are summarized in table 5-7. The overall coefficient alpha for the scale was well above the .6 level at a good .7499.

Table 5-7
Reliability and Item Analysis for
Strength of the Virtual Organization

Item	Discrimination Index	Alpha if Item Deleted
deviate from policy (job)	.5616	.7063
adherence to rules**	-.0098	.8005
non-standard solutions	.5438	.7100
accepted solutions	.4983	.7188
deviation from solution	.6169	.6963
creativity	.3908	.7393
deviate from policy (performance)	.4967	.7203
success vs. rules	.5305	.7122

* coefficient alpha = .8005 (after delete)
** deleted from factor analysis

Only a single item "adherence to rules" (-.0098) failed both the discrimination index and raised the overall reliability of the scale if deleted. The discrimination index was actually negative indicating a poor question. By deleting the item, the overall reliability of the scale was improved to .8005. The actual wording of the deleted item was: The 3-letter organization has an accepted solution to most problems. This information was also tested by "non-standard solutions." Thus, deletion of the item should not significantly affect the information being gathered. The item was deleted from further consideration.

Performance. The results of the reliability and item analysis for the scale measuring performance are summarized in table 5-8. The overall coefficient alpha for the scale was a strong .8384 which is well above the .6 cut-off.

Table 5-8
Reliability and Item Analysis for Performance

Item	Discrimination Index	Alpha if Item Deleted
too long	.3890	.8332
delays	.5855	.8047
superior quality	.6466	.7981
price acceptable	.5943	.8045
cost too high	.5766	.8057
fulfilling	.6699	.7929
successful project	.5855	.8047
good example	.7242	.7833

coefficient alpha = .8384

All items passed both tests and therefore none were deleted. All items will accordingly be included in the factor analysis.

The above described item and reliability analysis was performed to eliminate items that did not contribute to the measurement of the constructs. Table 5-9 summarizes the items deleted in this step of the analysis. This step in the analysis has verified that the instrumentation has reliably measured the constructs intended and that the retained items all make a contribution to the information obtained.

Table 5-9
Items Deleted in Item Analysis

Nature of Relationship
adherence to rules
regular milestones
Strength of the Virtual Organization
adherence to rules

Accordingly, these items will not be included in further analysis of the data.

Factor Analysis

The data set as modified by the item and reliability analysis was subjected to factor analysis to test the theoretical basis of the model. Each construct is discussed in order.

Architecture of the parent organization. In chapter three, it was initially proposed that this construct was made up of the structure of the parent organization as represented by centralization and formalization. Existing instrumentation was proposed to measure these. This construct was postulated to have four dimensions: hierarchy of authority, participation in decision-making, codification and rule observation (Aiken and Hage, 1966). In order to test the factors that make up the architecture of the parent organization, the items were subjected to a principle components extraction using the varimax rotation. A single significant cross-loading in excess of .5 occurred with the

item "own boss." This item cross-loaded to both the factors hierarchy of authority and codification. To cross check this finding, an oblique rotation was conducted and yielded the same cross-load. Since both the conservative varimax rotation and the more flexible oblique solution yielded the same cross load, this indicates that the item contributed to two factors significantly and defies accurate interpretation. Thus, the item was deleted. The remaining items were subjected to the varimax rotation for the final analysis. The results of the factor analysis are summarized in table 5-10.

Table 5-10
Factor Analysis of
Architecture of the Parent Organization

	Hierarchy of Authority	Partic in D-M	Codification	Rule Observation
ask boss	.88479	.09374	.07712	.12647
small matters	.86951	.11206	.10062	.11152
boss approval	.82665	.11708	.17256	.12773
decision approval	.81144	.09332	.14046	.05475
decision discouragement	.78707	.10043	.17122	.21957
new staff	.09852	.84616	.04970	.07706
new programs	.09219	.83423	.04682	.02083
promotions	.02752	.80929	.05942	-.02439
new policies	.19017	.80010	.02851	.03191
do as please	.08471	.04583	.86537	.03219
own rules	-.04466	.02144	.76395	.13810
how things are done	.28841	.08720	.75018	.02390
own decisions	.36839	.04749	.70693	-.04482
employees checked	.18529	.04811	.04090	.92173
constantly watched	.23944	.02965	.09726	.90066
eigenvalues values	5.17312	2.41740	1.93334	1.42511
% of variance	34.5	16.1	12.9	9.5
cumulative variance	34.5	50.6	63.5	73.0

The items factored well into the four expected dimensions: hierarchy of authority, participation in decision-making, codification, and rule observation. The four factors explained 73% of the variance. Thus, no items were deleted and no further interpretation of the scale is required.

Nature of the relationship between the parent organization and the virtual organization. The theoretical basis for this construct presented in chapters two and three suggested three dimensions: level of reporting, level of

supervision, and power retained. Again, the data were subjected to principle components extraction with a varimax rotation. No significant cross-loadings in excess of .5 occurred, thus no items were deleted. The results of the factor analysis are summarized in table 5-11.

Table 5-11
Factor Analysis of
Nature of the Relationship

	level of reporting	level of supervision	Power retained (neg)	Power retained (pos)
up to date	.86169	.10033	.09816	.01524
progress reports	.80453	.05263	.08397	-.00398
required to report	.74769	.17723	.05421	.15084
superiors involved	.68205	.13591	.14257	.07682
results only	.18014	.78550	-.06452	-.03979
problems	-.11565	.69385	.13496	-.10792
everyday tasks	.31528	.58599	.09200	.02423
complete tasks	.27932	.56102	.04817	.32002
need information	.07788	-.08116	.85470	-.05781
need assistance	.19919	.09980	.80094	.13928
need resources	.06363	.17189	.52267	.24456
have resources	.13917	-.13990	.02128	.79582
no assistance	-.01029	.10892	.21991	.77221
eigenvalues	3.55755	1.67245	1.42354	1.17425
% variance	27.4	12.9	11.0	9.0
cumulative variance	27.4	40.2	51.2	60.2

The factor analysis yielded four factors rather than the expected three. The first two were expected: level of reporting and level of supervision. Interestingly, the final two factors make up the expected third factor-- power retained. Factor three represents the need for assistance

and factor four represents the lack of that need. This can be explained by probable differentiation in the minds of the respondents between dependence and the ability to perform one's job. A cumulative 60.2% of the variance was explained by these factors. No items were deleted from the analysis.

Member allegiance. Because allegiance is represented by a dummy variable, the scales were used to create this proxy and no factor analysis is required. The measures for commitment to the virtual organization and the parent organization are combined per the operationalization scheme described in table 3-1 to create the variable for allegiance. Thus a mean score for the team indicates these levels.

Climate of the virtual organization. In chapter three, it was proposed that this construct consisted of two dimensions: autonomy and potency. The data were subjected to a principle components extraction with a varimax rotation. No cross-loadings in excess of .5 occurred so no items were deleted from the analysis. The results of the factor analysis are summarized in table 5-12.

Table 5-12
Factor Analysis of
Climate of the Virtual Organization

	potency	autonomy
resources	.81576	.19541
team expertise	.79334	.15744
individual expertise	.74731	.14618
support	.63553	.07584
not questioned	.22034	.87991
results	.05735	.84891
no interference	.20538	.77210
eigenvalues	3.11335	1.41901
% of variance	44.5	20.3
cumulative variance	44.5	64.7

The factors interpret well into potency and autonomy respectively. A cumulative 64.7% of the variance is explained by the factors. No items were deleted from the analysis.

Strength of the virtual organization. In chapter three, it was proposed that this construct consisted of three dimensions: autonomy of goals, the use of unique solutions, and the effect of performance in the team on individual success. The items for this construct were subjected to a principle components extraction with a varimax rotation. A single significant cross-loading in excess of .5 occurred in the item "deviation from solution." An oblique rotation of the factors yielded the same cross-loading. This indicates that the item significantly contributes to two factors and thus defies accurate interpretation. The information tested in this item was

also tested by "non-standard solution" so little, if any, information should be lost. The item was, therefore, dropped from the analysis. The remaining items were subjected to a varimax rotation with the results summarized in table 5-13.

Table 5-13
Factor Analysis of
Strength of the Virtual Organization

	unique solutions	effect of performance
accepted solution	.77324	.10675
deviate from policy (performance)	.77235	.06427
non-standard solutions	.77161	.11419
deviate from policy (job)	.67635	.28948
creativity	.02954	.90064
success vs. rules	.27995	.79969
eigenvalues	2.71291	1.17663
% of variance	45.2	19.6
cumulative variance	45.2	64.8

Only two of the three factors emerged from this analysis: the use of unique solutions and the effect of performance. However, the two factors explained 64.8% of the variance. The third factor "autonomy of goals" did not emerge from the factor analysis. This could be because it is not a factor contributing to the strength of the virtual organization, or because of a deficiency in the instrumentation. Since the items intended to measure this construct may be interpreted to support the other factors,

the problem likely lies in the instrumentation and not the theory. No further items were deleted from the analysis.

Performance. In chapter three, it was proposed that this construct consisted of four dimensions: time, quality, cost and process. The items used to measure this construct were subjected to a principle components extraction with a varimax rotation. No cross-loadings in excess of .5 occurred so no items were deleted. The results of the factor analysis are summarized in table 5-14.

Table 5-14
Factor Analysis of Performance

	general	time
successful project	.84505	-.05636
superior quality	.83984	.05189
fulfilling	.82684	.11672
good example	.72881	.37779
price acceptable	.71126	.19177
cost too high	.57097	.41216
delays	.03761	.84061
too long	.14948	.79887
eigenvalues	3.85952	1.34409
% variance	48.2	16.8
cumulative variance	48.2	65.0

Only two factors emerged from the analysis explaining 65.0% of the variance. The factors interpret as general success and time success. General success is a combination of the items intended to measure "quality," "cost," and "process." No items were deleted from the analysis.

In summary, two items were deleted from the analysis due to cross-loading across factors. The deleted items are summarized in table 5-15. These items were deleted because of difficulty of interpretation.

Table 5-15
Items Deleted in Factor Analysis

Architecture of the Parent Organization
own boss
Strength of the Virtual Organization
deviation from solution

On the whole, the constructs factored in accordance with the theory proposed in chapter three, however, there were some changes. The deleted items had redundant items to test the same or similar information built into the instrumentation, so little or no information should be lost from their deletion. The analysis is summarized in table 5-16.

Table 5-16
Summary of Factor Analysis

Proposed in chapter three	Revealed in factor analysis
Architecture of the Parent Organization hierarchy of authority participation in decision-making codification rule observation	**Architecture of the Parent Organization** hierarchy of authority participation in decision-making codification rule observation
Nature of Relationship power retained level of supervision level of reporting	**Nature of Relationship** power retained (positive) power retained (negative) level of supervision level of reporting
Climate of the Virtual Organization potency autonomy	**Climate of the Virtual Organization** potency autonomy
Strength of the Virtual Organization unique solutions effect of performance autonomy of goals	**Strength of the Virtual Organization** unique solutions effect of performance
Performance time cost quality process	**Performance** time general performance

With few exceptions the instrumentation measures the intended constructs and supports the theory. The data provided by the survey results will provide the information needed to test the research model.

Analysis Results

This section presents the statistical results for each of the research questions and hypotheses proposed in chapter three. A summary of the analysis plan to answer the research questions and test hypotheses may be found in table 5-17. This section will address the research questions individually and test the appropriate hypotheses per research question. Interpretation of these results will be discussed in chapter six.

Research Question One

The first research question posed in chapter one was: How does the strength of the virtual organization affect its performance? Models one and two as seen in table 5-17 are designed to answer this question. Embedded in this portion of the analysis are the tests of the following hypotheses:

Model one will test H1a: This effect will be moderated by task characteristics.

Model two will test H1: A virtual organization with strong empowerment will perform better in terms of customer satisfaction than one with weak empowerment.

Table 5-17
Regression Models and Variables

	Team Analysis			Individual Analysis	
	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent Variable	Performance	Performance	Strength	Member Allegiance	Climate of the V.O.
Predictors Team Level Analysis					
Complexity	X	X			
Strength of V.O.		X			
Allegiance			X		
Architecture V.O.			X		
Interaction Effects (Allegiance/Architecture V.O.)			X		
Predictors Individual Level Analysis					
Architecture P.O.				X	X
Nature of Relationship				X	X
Hypothesis Tested	H1a	H1	H2	H3,H5	H4,H6
Research Question Examined	RQ1	RQ1	RQ2	RQ2a RQ2b	RQ2a RQ2b

Zero-order Pearson r correlation coefficients for the variables summarized in table 5-18. Initially, the high significance of the correlation among independent variables was troubling, however, most of the suggested multi-collinearity is explained by the structure of the model or the operationalization schemes of the variables. The relationship marked "A" in table 5-18 between climate of the virtual organization and allegiance ($p < .0000$) is the most critical. A significant coefficient of $r=.3466$ suggests that these two variables may be strongly related. However, since it is the combined effect of these two variables that is postulated to affect the strength of the virtual organization, this relationship will not confound the interpretation of the analysis. This relationship will, however, make it more difficult to partition the variance explained by the two variables. The highly significant correlations marked "B" and "C" in table 5-18 are explained by the fact that the combined effects of climate of the virtual organization and allegiance is the product of those two variables. Thus it is a mathematical necessity that they be highly correlated. Finally, the significant correlations marked "D," "E," and "F" are due to the hierarchical structure of the model. The hypotheses state that strength of the virtual organization, allegiance and

Table 5-18
Pearson Correlations for
Team Level Analyses

	1	2	3	4	5
1. Allegiance	1.000				
2. Architecture of the V.O.	.3466*[A]	1.000			
3. Combined effect of Allegince and Architecture of V.O.	.9036*[B]	.7075*[C]	1.000		
4. Strength of the V.O.	.3548*[D]	.4253*[E]	.4661*[F]	1.000	
5. Complexity	.0882	.0222	.0666	.0965	1.000

* significant at p<.05

their combined effect will cause strength of the virtual organization. Thus, these correlations are the desired effect of the model.

A hierarchical regression was performed with the results summarized in table 5-19.

Table 5-19
Regression for Research Question One
Performance

Predictor Variable	β	T	Sig-T	R^2	ΔR^{2**}
Complexity	.021	2.90	.0049	.0928	.0928*
Strength	.99650	5.55	.0000	.3430	.2502*
Overall F = 21.14, d.f. 2,81, p < .0000					

* Significant at P < .001

** The null hypothesis that the regression coefficients are significantly different from zero is tested by calculating the change in R-squared after entering each new block of the regression analysis.

The hierarchical method suggests that because of the interrelatedness of the different levels of the model, theory must suggest the order of entry of the independent variables into the regression analysis. Thus, the structure of the research model seen in chapter three dictates the entry of the variables according to table 5-19 above. These

results will be discussed in relation to the hypotheses and then the research question as a whole.

The results for model one as seen in table 5-17 and beta 1 in table 5-19 address hypothesis one A. The hypothesis postulated that complexity would be a moderating variable in the model. The proper way to test for a moderation effect is through interaction (Venkatramin, 1987). An initial test of the interaction term proved to be non-significant (p=.1619). Thus the model was tested with complexity as a direct effect on performance. The results for this test are seen in table 5-19. The control variable complexity explains approximately 9% of the variance in performance at a significance level of p=.0006. Hypothesis one A is therefore not supported, but complexity is supported as a control variable with a direct effect on performance. This effect must be partitioned out in order to study the effects of the other block variables. The remainder of the analysis will be conducted using complexity in this role as a control variable. The revised model and the hypotheses may be seen in figure 5-1.

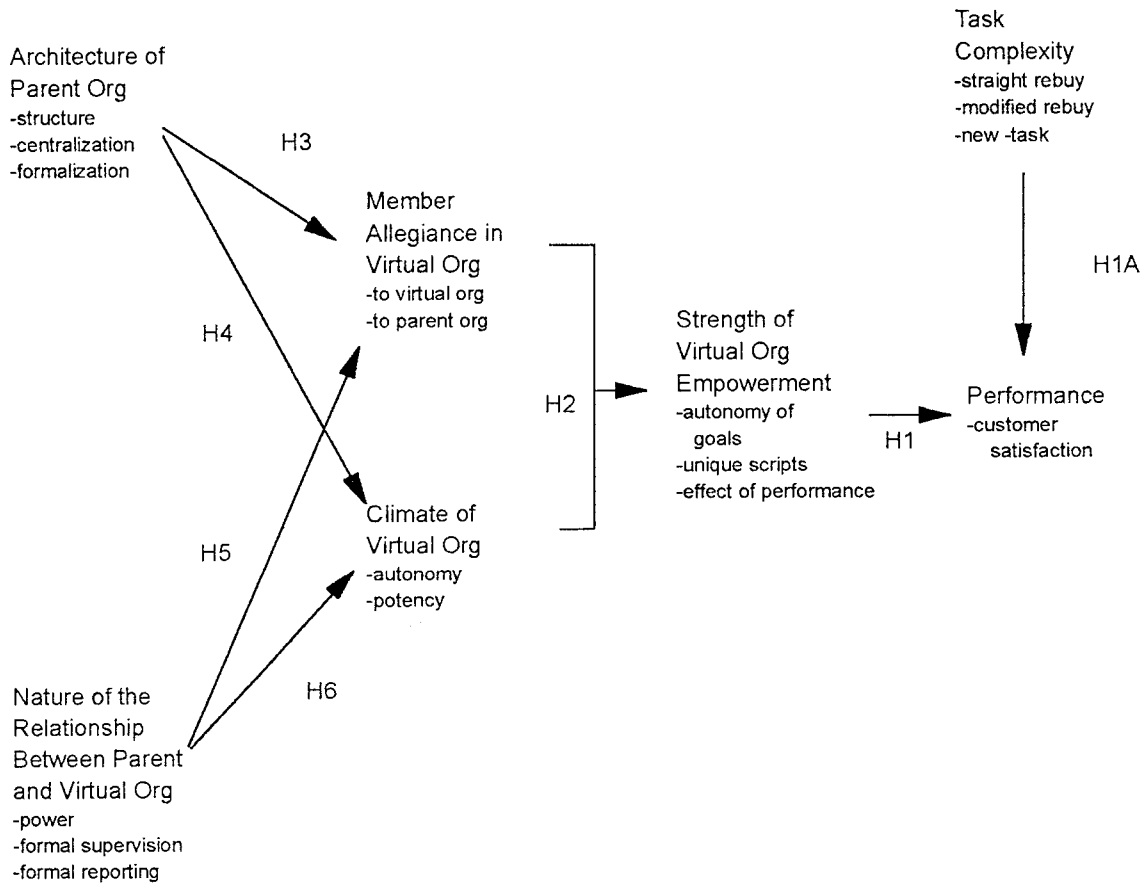

Figure 5-1
Revised Model Using Complexity as a Control

The results for model two in table 5-17 and beta 2 in table 5-19 address hypothesis one. Strength and complexity together explain 34.3% of the variance in performance at a significance level of $p<.0000$. This result yields strong support for hypothesis one. A virtual organization with strong empowerment is supported as performing better in terms of customer satisfaction than one with weak empowerment.

The answer to research question one lies in the results of these regressions. The strength of the virtual organization is positively correlated with performance. Along with complexity, 34% of the variance in performance is explained by this relationship. The only change in the research model dictated by these findings is that complexity is a direct, controlling variable rather than a moderating variable. These findings clearly suggest that there are benefits in terms of performance from the virtual organizational structure. As the strength of the empowerment of the virtual organization increases, performance improves. Discussion of these results may be found in the next chapter.

Research Question Two

The second research question posed was: what factors interact to affect the strength of the virtual organization? This question is answered through model three in table 5-17. The main effects and the combined effects of member allegiance in the virtual organization and the climate of the virtual organization are the independent variable to explain the variance in the strength of the virtual organization.

Model three will test H2: The interaction of member allegiance of the virtual organization and the climate of the virtual organization will be positively correlated with

the strength of the virtual organization. The results of this model may be found in table 5-20.

Table 5-20
Regression for Research Question Two
Strength of Empowerment of the V.O.

Predictor Variable	β	T	Sig-T	R^2	ΔR^{2**}
Member Allegiance	.36155	.27	----	.0478	.0478*
Architecture of the V.O.	.21838	1.19	----	.1979	.1501*
Interaction (alg X arch)	.0732	2.0	.0461	.2362	.0383*
Overall F = 8.246, d.f. 3,80, p < .0000					

* Significant at P < .05

** The null hypothesis that the regression coefficients are significantly different from zero is tested by calculating the change in R-squared after entering each new block of the regression analysis.

The results show that the combined effects of member allegiance in the virtual organization and climate of the virtual organization explain over 23% of the variance in the strength of the virtual organization. This result is significant at p<.0000 with the change in r-squared due to the interaction term significant at p =.0461. A partitioning of the variance was performed which showed that

the major portion of the variance was explained by the interaction term. The interaction term explained over 21% of the variance alone. The positive beta suggests the positive correlation between the constructs. These results provide support for hypothesis two. The interaction of member allegiance of the virtual organization and the climate of the virtual organization is supported as positively correlated with the strength of the virtual organization. Thus, to answer research question two: member allegiance in the virtual organization and climate of the virtual organization interact to explain 23% of the variance in the strength of the virtual organization. This issue will be discussed in greater detail in the next chapter.

Research Questions Two-A and Two-B

The next research questions posed were: 2a) what characteristics of the parent organization cause strong virtual organizations? and 2b) what is the nature of the relationship between the virtual organization and parent organization that causes strong virtual organizations? To answer these questions, the following hypotheses were posed in chapter three:

H3: A restrictive structure in the parent organization will be negatively correlated to high virtual organizational allegiance in members of the virtual organization.

H4: A restrictive structure in the parent organization will be negatively correlated to potency and autonomy in the virtual organization.

H5: A tightly coupled relationship between the parent organization and the virtual organization will be negatively correlated to high virtual organizational allegiance in members of the virtual organization.

H6: A tightly coupled relationship between the parent organization and the virtual organization will be negatively correlated to potency and autonomy in the virtual organization.

The answers to these research questions and the tests to these hypotheses lie in models four and five found in table 5-17. A zero-order Pearson correlation r may be seen for the independent variables in table 5-21. The relationship is significant at the $p < .0000$ level. This suggests a problem with multi-collinearity. In order to partition the variance explained, the variables will be entered into the model alone and then in differing orders. This indicates which variable, if either, is contributing more to the variance.

Table 5-21
Pearson Correlations for
Individual Level Analyses

	1	2
1. Architecture of the P.O.	1.000	
2. Nature of the Relationship	.2628*	1.000

* significant at p<.0000

Hypotheses three and five will be addressed first. These hypotheses are tested by model four in table 5-17. Member allegiance in the virtual organization is the dependent variable, while architecture of the parent organization and nature of the relationship between the virtual organization and the parent organization are the independent variables. The results of this regression may be found in table 5-22.

Table 5-22
Regression for Research Question Two A and B
Member Allegiance

Variable	Beta	T	Significant T
Architecture P.O.	.04721	7.06	.0000
Nature of Relationship	.03517	0.42	.6774
R-Squared .1702			
F 27.70			
p-value .0000			

The results to this regression suggest that 17% of the variance in allegiance is explained by this model at a highly significant level ($p<.0000$). However, the individual regression coefficient for nature of the relationship between the virtual organization and parent organization is not significant ($p=.6774$). On the other hand, the regression coefficient for architecture of the parent organization is highly significant ($p<.0000$). This result suggests support for hypothesis three. Because of the measurement scheme for architecture of the parent organization, a higher score indicates a less restrictive architecture. Thus, the positive regression coefficient supports that a restrictive structure in the parent organization will be negatively correlated with virtual organization allegiance. The lack of significance for the regression coefficient for nature of the relationship between the virtual organization and the parent organization indicates that there is no support for hypothesis five. The partitioning of the variance was not necessary due to the non-significant nature of relationship variable. The possible causes for this lack of significance will be discussed in detail in chapter six.

Hypotheses four and six are tested by model five in table 5-17. Climate of the virtual organization is the dependent variable, while architecture of the parent organization and nature of the relationship between the

virtual organization and the parent organization remain the independent variables. The results to this test are found in table 5-23.

Table 5-23
Regression for Research Question Two A and B
Climate of the Virtual Organization

Variable	Beta	T	Significant T
Architecture P.O.	.03501	5.80	.0000
Nature of Relationship	.13508	1.79	.0714
R-Squared .1439			
F 22.69			
p-value .0000			

The results to this regression suggest that over 14% of the variance in allegiance is explained by these two variables at a highly significant level ($p<.0000$). However, the individual regression coefficient for nature of the relationship between the virtual organization and parent organization is only moderately significant ($p=.0714$). On the other hand, the regression coefficient for architecture of the parent organization is highly significant ($p<.0000$). These results suggest strong support for hypothesis four. Because of the measurement scheme for architecture of the parent organization, a higher score indicates a less restrictive architecture. Thus, the positive regression

coefficient supports that a restrictive structure in the parent organization will be negatively correlated with climate of the virtual organization. Hypothesis six is supported to a lesser extent. The moderate significance ($p=.0714$) suggests that a tightly coupled nature of the relationship between the virtual organization and parent organization is negatively correlated with climate of the virtual organization.

A partitioning of the variance due to multi-collinearity effects indicated that the majority of the variance in the climate of the virtual organization is explained by the architecture of the parent organization. A regression using the independent variable of architecture of the parent organization is significant ($p<.0000$) and explains over 13% of the variance in climate of the virtual organization. The same regression using nature of the relationship as an independent variable is also significant, but explains only 3.7% of the variance. This is intuitively supported by the moderate significance of the nature of the relationship variable. All of the results will be discussed in detail in the next chapter.

In light of these findings, the answer to research question two-A is clear. The architecture of the parent organization has a significant effect on both allegiance and the climate of the virtual organization and thus strong virtual organizations. The answer to research question two-

B is more ambiguous. The nature of the relationship between the virtual organization and the parent organization has a moderate effect on architecture in the virtual organization, but no effect was found on member allegiance in the virtual organization.

Summary

The analysis detailed in this chapter suggests strong support for the research model with only slight modifications. The results of the analysis are summarized in table 5-22 below.

Table 5-24
Summary of Results

Hypothesis	Support	Model	Significance
H1a*	strong	1	p<.0000
H1	strong	2	P<.0000
H2	strong	3	p<.0461
H3	strong	5	p<.0000
H4	strong	6	p<.0000
H5	not supported	5	p=.6774
H6	moderate	6	p=.0714

*modified to treat complexity as a control variable

In summary, the item analysis and the factor analysis indicate that the instrumentation measures the intended constructs well. The factor analysis confirms that, on the

whole, the expected factors explained the variance in the constructs. Finally, the regression analysis tests the hypotheses and suggests answers to the research questions. The implications of these findings and the answers to the research questions will be discussed in detail in chapter six.

CHAPTER 6

DISCUSSION

Introduction

The purpose of this chapter is to discuss the implications of the analyses found in the chapter five. First, the empirical results will be discussed. A modified model of the dynamics of the virtual organization will be presented in light of these findings. This model is discussed in terms of the factor analysis results and the regression analysis results. Next, the implications of these findings will be discussed in relation to practitioners. This is followed by a section that generalizes the findings. Finally, the limitations of the research will be examined. Throughout this chapter, the results of the follow-on interviews described in chapter four are interspersed as appropriate.

Empirical Findings

As discussed in chapter five, the proposed research model was changed in two important ways: complexity acted as a control variable rather than a moderating variable, and

the connection between the nature of the relationship between the parent organization and the virtual organization and member allegiance was not significant. The "new" model as suggested by these findings may be seen in figure 6-1.

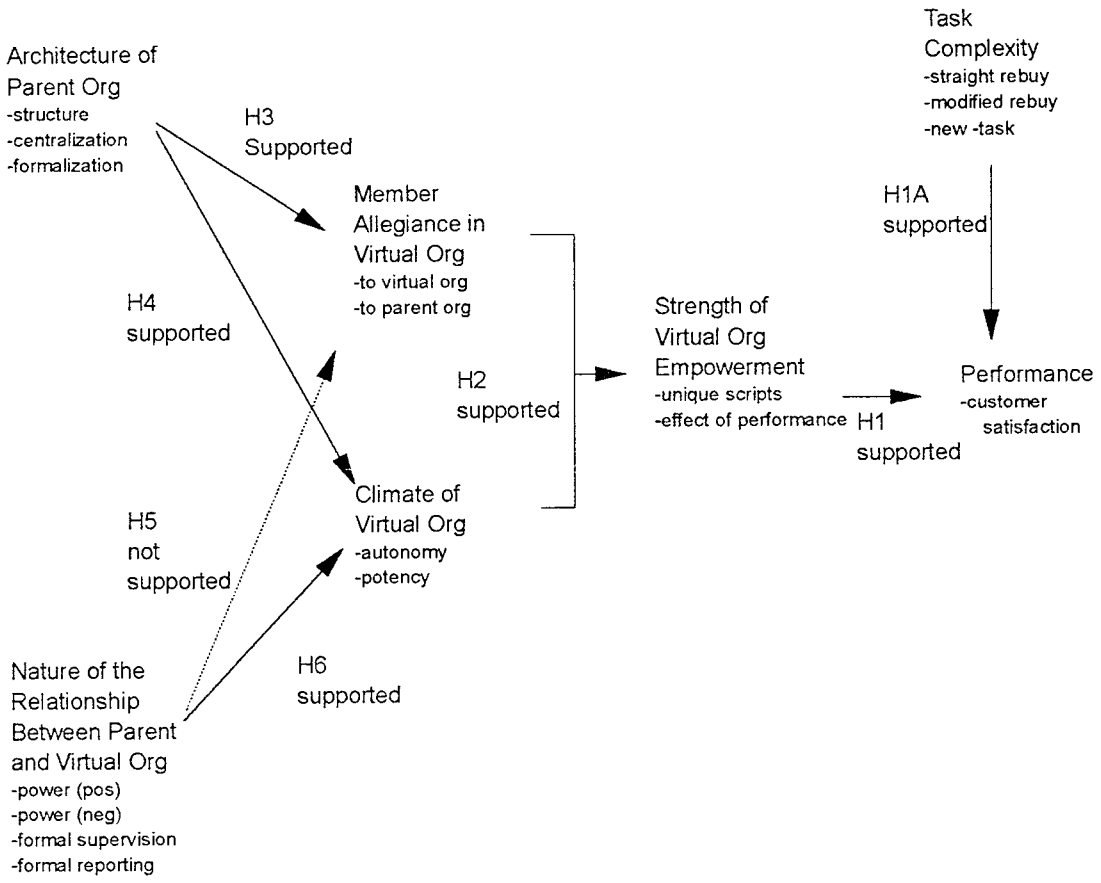

Figure 6-1
Modified Model

The model suggests that performance is affected directly by the strength of the virtual organization, but complexity is a control variable with its own direct effect.

Strength of the virtual organization is caused by the combined effect of member allegiance and climate of the virtual organization. Allegiance is caused only by the architecture of the parent organization. The effect of the nature of the relationship between the parent organization and the virtual organization on allegiance was not supported. Finally, climate of the virtual organization is caused by both architecture of the parent organization and the nature of the relationship between the parent organization and the virtual organization. These relationships will be discussed in detail.

Factor Analysis Discussion

The results of the factor analysis may also be seen in figure 6-1. Each construct will be discussed in light of the factors that emerged from this analysis.

Architecture of the parent organization. The expected dimensions of architecture of the parent organization emerged from the factor analysis as theory would suggest. The four elements of centralization and formalization (hierarchy of authority, participation in decision-making, codification, and rule observation) all emerged from the factor analysis. This indicates that the structure that is imposed by management in the parent organization does represent the architecture of the parent organization. By controlling these four elements, the architecture of the parent organization may be effectively managed.

Nature of the relationship between the parent organization and the virtual organization. The theory presented in chapter three suggests that the factors that make up the nature of the relationship between the parent organization and the virtual organization are the level of formal supervision, the level of reporting required, and the power retained by the parent organization. Both the level of supervision and the level of reporting emerged in the factor analysis. However, power retained by the parent organization emerged as two factors: power (positive), and power (negative). When statistically forced to three factors, power retained by the parent organization did emerge as a single factor. A discussion of power (positive) and power (negative) is warranted.

An examination of the items used to test power retained by the parent organization reveals that the power (positive) items indicate an individual's ability to complete his or her job without assistance. The power (negative) items indicate a dependence on the parent organization. These findings indicate that individuals differentiate in their minds between an ability to do one's job and dependence for help. Follow on interviews verified that individuals were reluctant to admit that they could not perform even when assistance in the form of resources or information was necessary. Because the two dimensions factored as one when

statistically forced, they were treated as one dimension in the analysis.

These results imply that the parent organization can affect the nature of the relationship between the parent organization and the virtual organization through the levels of supervision and reporting. However, even when control of resources and information are retained, the parent organization can foster a "loosely coupled" relationship by increasing the power (positive) factor.

Member allegiance in the virtual organization. This construct was measured using organizational commitment instrumentation for both the virtual organization and the parent organization and then operationalized through the scheme in figure 3-2. A paired t-test was used to verify that the two commitment levels were not the same measure, but interestingly, the two commitment levels were positively correlated. This suggests that commitment to the virtual organization and the commitment to the parent organization rise and fall at the same time. This could indicate that the measure of organizational commitment needs to be refined in order to measure member allegiance, or that a simple comparison of these levels does not completely capture the essence of allegiance. This construct should be more closely examined in future research.

Climate of the virtual organization. The theory presented in chapter three suggests that autonomy and

potency are the elements that comprise the climate in the virtual organization. These two factors emerged from the analysis. Autonomy suggesting that individuals are free to act and potency suggesting that individuals feel they are capable of succeeding. The structure of the model suggests that these factors may be controlled by managers either directly, or through the management of architecture in the parent organization or the nature of the relationship in the virtual organization.

Strength of the virtual organization. Three factors (autonomy of goals, use of unique scripts, and the effect of performance in the virtual organization on success) are suggested by theory. Only two of these factors emerged from the analysis: unique scripts and effect of performance. Autonomy of goals did not emerge. This result was, at first, confusing. However, follow-on interviews with acquisition managers indicated that the items on the survey asked them to admit that they willfully ignored parent organizational goals. They felt that the freedom to set aside parent organizational goals when necessary was important, but that they did not necessarily set them aside. This probably confounded the measurement of this factor. In order to further refine the measurement of the strength of the virtual organization, this confound must be overcome.

Performance. Recall that performance was operationalized as a combination of self-reported

information, interviews with end users and a review of the contract files. Pearson r correlations were used to verify that the differing measurements were indeed significantly and positively correlated. This finding lends further validity to the measurement scheme for the performance construct. The factor analysis was possible only on the self-reported data. Theory suggests that performance is made up of four factors: cost, time, process, quality. Only two factors emerged from the analysis: time and a general factor made up of the other three. This result may have been caused by the self-reported nature of this part of the construct. Follow-on interviews suggest that in the minds of the respondents, time is the most important factor on which they are evaluated. The other performance factors are measured by the parent organization supervisors at a later date and thus are less important to the respondent.

In summary, the factor analysis confirmed most of the dimensions of the constructs in the model. The measurements of these constructs are sufficient to perform the regression analyses necessary to test the hypotheses.

Regression Analysis Results

The implications of the regression analysis will be discussed in this section. The results, in terms of support for the hypotheses may be seen in the revised model found in figure 6-1. Each research question and its respective hypotheses will be discussed in terms of its implications.

Research question one. This research question asks how does the strength of the virtual organization affect its performance? The results of the hierarchical regression and the tests of hypotheses one and one A answer this question. A stronger virtual organization performs better than a weaker virtual organization. This effect is stronger in the high complexity environment and may be confounded in the low complexity environment. Support for this finding is found in the discussion of the individual hypotheses.

Hypothesis one stated that a virtual organization with strong empowerment will perform better in terms of customer satisfaction than one with weak empowerment. This hypothesis is strongly supported by the analysis suggesting that performance can be explained through the empowerment of the virtual organization. The implications of this finding have been suggested by past literature that virtual organizations have performance advantages in terms of dealing with uncertainty (Mackenzie, 1986a; Mackenzie, 1986b; Mowshowitz, 1992). The finding here advances this theory suggesting that not only is there a measurable degree of the virtual organization, but that as the virtual organization becomes stronger, performance is increased. When combined with the organizational flexibility advantages to the virtual organization structure suggested by Mowshowitz (1992), a new management perspective emerges.

By actively managing the virtual organization, managers may garner the performance advantages suggested by strong virtual organizations. Through the virtual organization, the manager may proactively address uncertainty through this greater flexibility. More specific suggestions for this management strategy are offered in the following sections and the section on practitioner implications.

A caveat that must be pointed out is that the relationship between performance and complexity is non-intuitive. This finding is interesting because it suggests virtual organizations perform better in complex situations and worse in simple situations. This phenomenon will be discussed in greater detail in the section for hypothesis one A.

Hypothesis one A states that the relationship between strength of the virtual organization and performance is moderated by task complexity. As revealed in the previous chapter, the moderation effect was not supported by the data. However, a strongly significant effect was revealed for task complexity acting as a control variable with a direct effect on performance. As mentioned above, the correlation was non-intuitive, indicating that the virtual organization performs better in a complex environment than a simple environment.

While initially surprising, this result may be explained through the structure of the virtual organization.

Simple tasks are performed well in most organizational structures (Mintzberg, 1973). The virtual organization, by its nature, may confound this seemingly natural effect. By confusing the issue of chain of command, the individuals in the virtual organization are given more to deal with. When dealing with complex situations, the virtual organization provides freedom of action through the use of unique solutions and the feeling that positive performance in the virtual organization will positively affect success in the parent organization. These effects combine to increase performance. However, in the low complexity arena, simple scripted solutions and controlled situations have been shown to be quite effective (Hogarth, 1987). By its nature the virtual organization is neither scripted nor controlled, and thus is better suited to deal with complexity.

Research question two. This research question asks: what factors interact to affect the strength of the virtual organization? The answer to this question also is clear. There is strong support for the interaction of member allegiance in the virtual organization and climate in the virtual organization affecting the strength of the virtual organization. However, the factor autonomy of goals does not show up in the measure of strength of the virtual organization. A possible explanation for this is provided above in the section "strength of the virtual organization."

Even in light of this problem, strong support is provided for hypothesis two.

Hypothesis two states that the interaction of member allegiance in the virtual organization and the climate of the virtual organization will be positively correlated with strength of the virtual organization. The results in the previous chapter support this hypothesis. This support suggests that through careful management of the commitment levels of the members of the virtual organization and by fostering autonomy and potency among virtual organization members, strong virtual organizations will be encouraged. When commitment to the virtual organization is high and commitment to the parent organization is low, the strongest encouragement of the strength of the virtual organization occurs. Conversely, when commitment to the virtual organization is low and commitment to the parent organization is high, the strongest discouragement to the strength of the virtual organization occurs.

These findings support the notion that through careful management of member allegiance to the virtual organization and climate of the virtual organization, that strength of the virtual organization can be fostered. The revised model suggests that these two constructs are caused by the architecture of the parent organization and the nature of the relationship between the parent organization and the virtual organization.

Research question two-A. This question asks: what characteristics of the parent organization cause strong virtual organizations? The results of the individual level analysis indicate that a less restrictive structure in terms of centralization and formalization encourage the strength of the virtual organization. This effect is seen through the mediating variables of member allegiance in the virtual organization and climate of the virtual organization. A closer examination of this effect is seen in the discussion of the individual hypotheses discussed next.

Hypothesis three states that a restrictive structure in the parent organization will be negatively correlated to high virtual organization commitment in the virtual organization. Strong support is provided for this hypothesis. As the architecture of the parent organization becomes more restrictive, allegiance to the virtual organization reduces. This finding suggests that managers who wish to foster allegiance to the virtual organization should provide a less restrictive architecture. A less restrictive architecture allows for the flexibility and allegiance that is the hallmark of the virtual organization.

Hypothesis four states that a restrictive structure in the parent organization will be negatively correlated to autonomy and potency in the virtual organization. This hypothesis is strongly supported by the data. As the structure of the parent organization becomes more

restrictive, feelings of autonomy and potency are reduced. By reducing restrictive structure in the parent organization, the climate of the virtual organization becomes more encouraging to strong virtual organizations.

Research question two-B. This research question asks: what is the nature of the relationship between the parent organization and the virtual organization that causes strong virtual organizations? The findings here are not as clear as with previous questions. While a loosely coupled relationship does foster autonomy and potency in the virtual organization, no support was found for a relationship between this construct and member allegiance in the virtual organization. Thus, the answer to the research question is that while a loosely coupled relationship between the parent organization and the virtual organization will encourage strong virtual organizations, this effect occurs only through the climate of the virtual organization, and not through allegiance. These results are discussed in terms of the individual hypotheses below.

Hypothesis five states that a tightly coupled relationship between the parent organization and the virtual organization will be negatively correlated to potency and autonomy in the virtual organization. This hypothesis was moderately supported by the analysis. The theoretical connection suggests that a loosely coupled nature of the relationship will encourage strong virtual organizations.

Hypothesis six states that a tightly coupled relationship between the parent organization and the virtual organization will be negatively correlated to high virtual organizational allegiance in members of the virtual organization. No support for this hypothesis is seen in the analysis. This is a difficult finding to interpret since the theory supports such a connection. The relationship between these two constructs also was supported by the interviews conducted in the pilot study. This indicates a problem in the measurement of the nature of the relationship construct or the view of this construct held by the respondents.

A factor analysis was performed combining the two constructs "nature of the relationship" and "architecture of the parent organization" to test if they were meausuring the same information. The expected results emerged from the factor analyis, revealing the expected dimensions of the two constructs. These dimensions were clear, with no cross-loadings in excess of .5. The results of this factor analysis support that the two constructs are separate.

Follow-on interviews were conducted to examine why the theoretical connection between the nature of the relationship between the parent organization and the virtual organization and member allegiance was not supported. Two possible solutions emerged from the interviews. First, the restrictive structure of the military was confounding this

relationship, and second, members of the virtual organization did not clearly separate the parent organization and the virtual organization in their minds. Each of these potential explanations is discussed next.

First, interviewees suggested that the more structured nature of the military environment causes the nature of the relationship between the parent organization and the virtual organization to be perceived as restrictive. Military organizations have rigid chains of command. This causes higher levels of reporting and supervision in the organization. This natural restrictiveness of the nature of the relationship for this study may have confounded any effects that were expected.

The second possible explanation for the lack of effect of this construct lies in the mind set of the members of the organization. Interviewees stated that they did not consider themselves to be exclusively the member of either the parent organization or the virtual organization. Also many respondents considered themselves members of the System Program Office and the acquisition team (virtual organization) only. The parent organization, as defined in this study, was the 3-letter organization (one level down from the System Program Office). This caused confusion in the minds of the respondents.

Thus, the two problems described above may be the cause of the lack of support for hypothesis five and the moderate

support for hypothesis six. These problems will be discussed further in the section on limitations of the research.

The revised model presented in figure 6-1 is supported by these findings. A less restrictive architecture in the parent organization and a loosely coupled nature of the relationship between the parent organization and the virtual organization will encourage strong virtual organizations. In turn, strong virtual organizations perform better in complex situations. The implications of these findings will be discussed in the next section.

Implications for Practitioners

The many implications of the virtual organization structure for managers are discussed here as are issues that emerged through the follow-on interviews. The control through the life-cycle, task focus, seamless management tools and cultural change are each discussed in detail.

Control though the life-cycle indicates that in the virtual organization, specialists from all parent organizations are integrally involved in the process. By promoting the virtual organization, members are involved with projects from beginning to end without a permanent structural change to the organization. The virtual organization also allows for the organizational structure to quickly respond to the needs of the task at hand without

time consuming organizational changes (Mackenzie, 1986a, Mackenzie, 1986b). Thus, by encouraging the virtual organization, control throughout the life-cycle may be maintained.

Task focus indicates that the virtual organization, by its very nature, forms to respond to a specific task. The task is the main focus of the work group at hand. As seen from the analysis in chapter five, as the freedom to focus on this task is increased through the strength of the virtual organization, performance improves. In order to truly focus on the product, experts from all required parent organizations must feel free to focus on the task at hand. By allowing the interaction of the members of the virtual organization, the interdependence of the different sub-tasks may be better understood. By encouraging the virtual organization, a greater task focus may be maintained.

Seamless management tools indicates that through the proactive management of the virtual organization, the interrelationships and dependencies of all potential parent organizations are understood and accounted for in the process. The hierarchical relationship of the structure of the parent organization and the virtual organization must be established in order to more closely optimize management decisions. By managing the virtual organization structure through the promotion of member allegiances, and autonomy and potency, teams are insured proper support and decision-

making at all levels is enhanced. As seen from the analysis, the task oriented nature of the virtual organization promotes a structure that improves performance in terms of customer satisfaction.

Finally, the virtual organization structure involves a cultural change. The important factors for the virtual organization become: customer satisfaction, the task, the process and the formal organizational structure. These priorities represent a major change from classical organizational structures. By promoting the virtual organization as a viable entity, through which members truly feel their success is recognized and rewarded, these changes can be made. The analysis suggests that the strength of the virtual organization construct represents these feelings and causes improved performance. The factors listed above represent an order of priorities that the virtual organization allows its members to pursue in order to achieve this improved performance.

Thus, these four issues, control through the life-cycle, task focus, seamless management tools, and cultural change are represented in the virtual organization. The virtual organization is shown in this research to have performance advantages for complex tasks. By managing the organizational structure to allow and encourage the virtual organization, these performance advantages may be realized.

Generalization of the Findings

In the context of this study, the virtual organization is an ad hoc grouping of individuals that exhibits blurred hierarchical reporting relationships, interdependence of task, resource sharing and dependency with multiple parent organizations and its own allegiance structure. While the virtual organization is part of the parent organization, it is also an entity unto itself. The virtual organization is not only a phenomenon within an organization, it is a type of organization. Although the precise definition of the virtual organization and its membership varies with context, this study has shown the virtual organization to have advantages in terms of performance.

Theory suggests that the virtual organization structure will have advantages in terms of flexibility, responsiveness, and adaptability. However, the results of this study reveal the properties of cooperation, allegiance and performance. The positive correlation between parent organization commitment and virtual organization commitment suggests that increased commitment to the virtual organization will increase commitment to the parent organization.

While the recognition of the advantages of the virtual organization is important, it is paramount that managers understand what the virtual organization is and what they are trying to accomplish through the promotion of the

virtual organization. The virtual organization is built around the task, not traditional organizational boundaries. The virtual organization should have the attributes of decentralized decision making, task focus, control throughout the life cycle, and cultural change. By promoting the virtual organization, the manager must understand that control is being relinquished in favor of cooperation and performance.

However the virtual organization is perceived by the manager, two important questions remain to be addressed by managers. First, how does one create a virtual organization? The results of this study show that by managing allegiance and climate in the virtual organization one can promote stronger virtual organizations. By encouraging autonomy and potency in the virtual organization, performance is improved.

Second, does the virtual organization lose its advantages as it becomes regulated? Organizations tend to codify successful organizational changes. The virtual organizations derives much of its advantages from its ad hoc nature. If managers attempt to regulate and control the virtual organization, its advantages may be lost. A reasonable hypothesis would be that as virtual organizations are regulated, they will lose their feelings of autonomy and potency, and thus allegiance changes. This, however, remains to be proven.

The challenge remains to answer the above two questions. The virtual organization may be seen as both a process and a structure. The manager will be required to relinquish control in order to take advantage of the virtual organization. The manager must be able to manipulate the process without stifling the natural flexibility of the virtual organization. Managing the virtual organization will be a struggle not to over control.

Limitations of the Research

Four limitations to this research emerge from the study: the sample, team size, team history, and the lack of effect of the nature of the relationship between the parent organization and the virtual organization. Each will be discussed.

The sample was taken from Air Force acquisition teams. While these teams represent the virtual organization well, there are organizational issues involved that may not be representative of organizations in general. First, the chain of command structure in the military is rigid. This rigid command structure may cause differing views of the parent organization and the nature of the relationship between the parent organization and the virtual organization. Next, the tasks involved were major systems acquisition tasks. All of these tasks contain a certain

level of complexity that the virtual organization seems to address well.

Team size was relatively small. Teams ranged from two to eight members. A larger team size may well mask or confound results. Averaging scores across a larger team may reduce the variance in the measurements. This problem is also related to the military issue because "doing more with less" is a way of life. Small teams with freedom and autonomy may be more common in this setting allowing for a greater strength of empowerment for the virtual organization.

Team history was not accounted for in this study due to the strict request of anonymity by the organizations involved. No data were collected about teams' previous working relationships or success. Controlling for team history would allow for more of the variance in performance to be partitioned in the model.

Finally, the construct "nature of the relationship between the parent organization and the virtual organization" was only moderately supported in the model. Intuition, follow-on interviews, and theory suggest that this construct should be in the model and have an effect. The causes for this may be many. First, the follow-on interviews suggest that some of the individual members did not consider themselves to be members of the 3-letter parent organization. This result would surely confound the

measurement of the relationship between the parent organization and the virtual organization. Second, some members expressed that the relationship between the two organizations is so seamless that to measure this construct is inherently difficult. Finally, the instrumentation itself may have been flawed. The items intended to measure this construct attempted to measure the intrusion of the parent organization on the efforts of the virtual organization. Follow-on interviews indicate that more specific questions as to the relationship of the two organizations rather than specific questions about the intrusion of the parent organization may be warranted.

All of these limitations have bearing on the interpretation of these findings. The implications for these limitations is discussed in the next chapter in the section on implications for future research.

Summary

The discussion in this chapter suggests strong incentive to encourage the virtual organization. By encouraging the strength of empowerment of the virtual organization the indicated performance improvement may be realized. The section on implications for practitioners outlined the advantages of the virtual organization in terms of control throughout the life-cycle, task focus, seamless management tools and cultural change. Finally the

limitations of the sample, team size, team history and lack of effect of the nature of the relationship between the parent organization and the virtual organization were addressed. The implications for future research of these findings are discussed in the next chapter.

CHAPTER 7

IMPLICATIONS FOR FUTURE RESEARCH AND CONCLUSIONS

Introduction

The purpose of this chapter is to place the research into theoretical perspective and to identify a research stream to enhance these findings. The chapter will begin with a section relating the goals described in chapter one to the results of the research. This is followed by a section on implications for future research. The chapter closes with a section on general conclusions.

Objectives of the Research

In chapter one, the objective of this research was stated: to verify the existence and effect of the virtual organization on performance. In order to meet this objective, three goals were set.

1. The existence of the virtual organization must be verified. Included in this goal was that a measurement instrument for the strength of the virtual organization must be developed.

2. The correlation between the strength of the virtual organization and specific organizational architecture must be examined.

3. The correlation between the strength of the virtual organization and task performance must be measured.

Each of these goals were met by this research contained herein.

The existence of the virtual organization was verified through interviews, examination of organization structure and the use of Mackenzie's (1986a, 1986b) definition of the virtual organization. The acquisition team clearly exhibits the blurred boundaries and chain of command issues of the virtual organization. An instrument to measure the strength of the virtual organization was developed based on the dimensions of the use of unique solutions, autonomy of goals and the effect of performance in the virtual organization on one's evaluation. Although the dimension of "autonomy of goals" did not emerge from the factor analysis, the strength construct held high reliability and differentiated among virtual organizations well.

The correlation between the strength of the virtual organization and specific organizational architecture was verified through regression analysis. Organizational architecture was shown to be highly correlated with both member allegiance in the virtual organization and the climate in the virtual organization. A less restrictive

architecture in the parent organization promoted positive results for the strong virtual organization through both of these mediating variables.

Finally, the correlation between the strength of the virtual organization and task performance was measured through regression analysis. In the context of this study, the strength of the virtual organization, as controlled by task complexity, was highly significant in explaining performance.

Implications for Future Research

This section will discuss the implications of this research and suggest a future research stream to further study the phenomenon of the virtual organization. First a section addresses possible solutions to the limitations of this research. Next a section discusses possible follow-ons to this research.

Solutions to the Limitations of the Research

In the previous chapter, four significant limitations to this research were identified: the sample, team size, team history and the lack of effect of the nature of the relationship between the parent organization and the virtual organization construct. Possible solutions to these problems are discussed in this section.

The sample was taken solely from one organizational context. While this context well represented the virtual

organization structure, certain biases may be inherent in it. As discussed in the previous chapter, the military chain of command is highly formal and rigid. A study of the virtual organization in the context of a less rigid setting would provide additional insight into this phenomenon. The advantages of the virtual organization accrue in the areas of flexibility and dealing with uncertainty (Mackenzie, 1986a; Mowshowitz, 1992). Thus, an organizational context that allows for tasks to vary in the areas of flexibility and uncertainty would allow for more findings in this area.

Mintzberg's classic taxonomy of organizational design ranges from the machine bureaucracy to the adhocracy. The advantages seen in the virtual organization also are seen in the adhocracy (Mintzberg, 1983). The military context represents more a machine bureaucracy than an adhocracy. A sample taken from an organization more closely representing an adhocracy may yield differing results.

Small teams, by their very nature, may be more empowered to complete tasks. The issue of team size may be addressed by obtaining a sample with larger and smaller teams. This may, however, be easier said than done. In order to gain access to larger teams, the number of teams being studied may be reduced and power lost. Finding an organization large enough to provide a sample with a large number of large teams may be difficult.

Team history was not available for this study. The organizations involved required strict anonymity and felt that such information would violate this requirement. By finding a sample that would allow for team history variables to be included in the study, more insight may be gained. The levels of interdependence of group members are important to group effectiveness (Shea and Guzzo, 1987). Like-wise, the virtual organization may form its own level of interdependencies based on the task. Controlling for these characteristics of the internal workings of the virtual organization will lead to greater insight into the effects of the virtual organization on performance.

Finally, the nature of the relationship between the parent organization and the virtual organization construct was not strongly supported by the data. As discussed in the previous chapter, this may have been due to the mind set of the individual respondents or in measurement problems.

If the mind set of the respondents is the problem, then changing the context of the study from Air Force acquisition teams to other organizations may not solve the problem. The team members need to understand the difference between and thus the nature of the relationship between the parent organization and the virtual organization. A less rigid organizational structure will only blur these lines further. Since the military context is a rigid structure, the problem probably lies in the measurement of the construct.

The instrumentation and instructions to respondents did not define the virtual organization (the acquisition team) nor the parent organization (the 3-letter organization). This relationship was identified through the organizational charts of the system program office. Follow-on interviews revealed that many respondents felt that the system program office was their parent organization. The instrumentation asked questions specifically about the acquisition team as the virtual organization and the 3-letter organization as the parent organization. Defining the virtual organization and the parent organization for the respondents may help this problem. However, the researcher must be careful not to bias the results through these definitions. Finally, once the entities are defined questions may be added that specifically address the relationship between the parent organization and the virtual organization.

Future Research

The virtual organization may be placed into a theoretical perspective. The virtual organization exists not only within organizations, but between organizations. Technology will not only encourage the virtual organization, but the virtual organization will require more advanced technology. Finally, the virtual organization promotes many of the tenets of the total quality perspective. Each of these perspectives is discussed below.

The context of the virtual organization for this research is within a single organization, the system program office. The virtual organization also exists as an organizational bridge between separate business entities (Mowshowitz, 1992). A study showing the effects of the inter-organizational relationships would complement these findings. Such a study would expand the definition of the virtual organization and more clearly define the parent organization. This context will encompass such issues as the "boundaryless organization" (Hirshorn and Gilmore, 1992). The virtual organization is increasingly aiding in the breakdown of formal organizational boundaries. A study of these effects is warranted.

A second follow on research project includes the effects of the virtual organization on technology and vice versa. The virtual organization is enabled by computer aided communications and in turn, the virtual organization encourages the use of computer aided communications (Mowshowitz, 1992). Communication among members of the virtual organization is facilitated through advanced information systems, while the need for faster communication across organizational boundaries creates a need for better technology. This is a classical "push-pull" scenario. A study as to the effects of the virtual organization in this context would be valuable.

Finally, a study relating the virtual organization concept and total quality management would provide greater insight into empowerment. Since it is the strength of empowerment of the virtual organization that encourages strong performance, the total quality perspective is encompassed by the virtual organization. As discussed in the previous chapter, the virtual organization stresses such total quality based issues as control through the life-cycle, task focus, seamless management tools and cultural change. Relating the effects of the virtual organization on the total quality approach would lead to greater understanding of organizational dynamics.

Conclusions

The virtual organization is no longer a "black-box" in the study of organizational design. A degree of strength of the virtual organization was defined and measured by this research. The strength of the virtual organization was shown to positively affect performance. The virtual organization clearly offers managers another tool to manage performance. The results of this study highlight the importance of the virtual organization and the proactive management of its functions.

APPENDIX A

Organizational Responsibility Grouping Chart for the Acquisition Team

Virtual organizations exist whenever for a given task the column contains:

1. three or more P entries

2. two or more P entries and two or more X entries

3. two or more P entries, one or more X entries and two or more S1 and S2 entries

Thus, the following matrix defines the virtual organization in each of the mjor tasks of the acquisition.

	Solicitation	Evaluation	Fact Finding	Negotiation	Administration
Program Mgt	S1/P, S2	S1/P, S2	S1/P, S2	P	S1/P, S2
Contracts	S1/P, S2	S1/P, S2	S1/P, S2	S1/P, S2	S1/P, S2
Engineer	X	X	P	X	X
Manufacturing	X	X	P	X	X
Program Control	X	X	X	X	X
Logistics	X	X	P	X	X

O = Position is not involved in the task process

X = Position neither performs nor supervises but is consulted in matters relating to the task process

P = Position is directly responsible for performing task process

S1/P = Position both performs the task process and is the immediate supervisor of others performing task process.

S2 = Position is the supervisor of the immediate supervisor of the task process

APPENDIX B

Questions to Validate the Model

The following questions will be asked of typical acquisition team members to validate the model.

1. How does the complexity of the acquisition affect the performance on the team?

2. What 3-letter and SPO factors do you feel affect an acquisition team's performance?

3. What acquisition team factors do you feel affects an acquisition team's performance?

4. Do you feel more empowered to do your job when your allegiance is to the 3-letter organization or to the acquisition team?

5. Is there anything you would like to add in relation to this study?

Appendix C
The Survey Instrument

PART I: DEMOGRAPHICS

What is your Functional Area (e.g. Contracts, Manufacturing etc.)? _____

What Integrated Program Team do you work on? _____

1. What is your rank? _____

2. Would you consider yourself

a. Upper Management
b. Mid-Level Management
c. Low-Level Management
d. Non-Managerial

3. What is your age? _____ 4. Gender M F

5. What is your educational background? Undergraduate Masters Other: _____

6. How many acquisition related courses have you successfully completed? _____

7. How many years experience have you had **in acquisition**?

1-3, 4-6, 7-9, 10-12, 13-15, more than 15

8. Is acquisition your **primary** career field? Y N

9. Do you have any Professional designations? (PE, CPCM etc.) _____

PART II: INFORMATION ABOUT YOUR 3-LETTER ORGANIZATION

A. Please indicate your level of agreement with each statement, where 1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA). **Direct answers as they relate to your 3-letter organization.**

		SD N SA
1.	There can be little action taken here until my supervisor approves a decision.	1 2 3 4 5 6 7
2.	A person who wants to make his own decision would be quickly discouraged in this 3-letter organization.	1 2 3 4 5 6 7
3.	Even small matters have to be referred to the 3-letter organization for a final answer.	1 2 3 4 5 6 7
4.	I have to ask my boss before I do almost anything.	1 2 3 4 5 6 7
5.	Any decision I make has to have my boss' approval.	1 2 3 4 5 6 7

B. Please respond to the following statements on a scale of 1 to 7 where 1 = never, 4 = sometimes, and 7 = always. **Direct answers as they relate to your 3-letter organization.**

		N		SM		A
1.	How frequently do you participate in the decision to hire new staff?	1	2	3	4	5 6 7
2.	How frequently do you participate in the decisions on the promotions of the professional staff?	1	2	3	4	5 6 7
3.	How frequently do you participate in the decisions on adoption of new policies?	1	2	3	4	5 6 7
4.	How frequently do you participate in the decisions on the adoption of new programs?	1	2	3	4	5 6 7

C. Please indicate your level of agreement with each statement, where 1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA). **Direct answers as they relate to your 3-letter organization.**

		SD		N		SA
1.	I feel that I am my own boss in most matters.	1	2	3	4	5 6 7
2.	A person can make his own decisions without checking with anybody else.	1	2	3	4	5 6 7
3.	How things are done here is left up to the person doing the work.	1	2	3	4	5 6 7
4.	People here are allowed to do almost as they please.	1	2	3	4	5 6 7
5.	Most people here make their own rules on the job.	1	2	3	4	5 6 7
6.	Employees are constantly being checked on for rules violations.	1	2	3	4	5 6 7
7.	People here feel they are constantly being watched, to see that they obey all the rules.	1	2	3	4	5 6 7

D. Please respond to the following statements on a scale of 1 to 7, where 1 = "everyday" (ED), 4 = "sometimes" (S), and 7 = "never" (N).

		ED		S		N
1.	I depend on the 3-letter organization for resources necessary to complete tasks.	1	2	3	4	5 6 7
2.	I can complete all acquisition tasks without asking for additional resources from the 3-letter organization.	1	2	3	4	5 6 7
3.	I have sufficient information to complete all acquisition tasks.	1	2	3	4	5 6 7
4.	I must obtain information from other the 3-letter organization to complete acquisition tasks.	1	2	3	4	5 6 7
5.	I must depend on assistance from the 3-letter organization to complete acquisition tasks.	1	2	3	4	5 6 7
6.	I can complete acquisition tasks without assistance from the 3-letter organization.	1	2	3	4	5 6 7

E. Please respond to the following statements on a scale of 1 to 7, where 1 = "everyday" (ED), 4 = "sometimes" (S), and 7 = "never" (N).

		ED		S				N
1.	I am required to report to my superiors in the 3-letter organization.	1	2	3	4	5	6	7
2.	My superiors in the 3-letter organization ask for progress reports.	1	2	3	4	5	6	7
3.	I must keep my superiors in the 3-letter organization completely up to date on the progress of my work.	1	2	3	4	5	6	7
4.	My superiors in the 3-letter organization become involved in the acquisition tasks.	1	2	3	4	5	6	7

Please indicate your level of agreement with each statement, where 1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA).

		SD		N				SA
5.	I can complete my tasks without reporting to my superiors in the 3-letter organization.	1	2	3	4	5	6	7
6.	My superiors in the 3-letter organization only want to know about results, not about everyday work.	1	2	3	4	5	6	7
7.	My superiors become involved in my tasks every day.	1	2	3	4	5	6	7
8.	My superiors become involved in my tasks only at regular milestones.	1	2	3	4	5	6	7
9.	My superiors become involved in my tasks only when problems occur.	1	2	3	4	5	6	7

PART III: INFORMATION ABOUT THE ACQUISITION TEAM (Integrated Program Team)

A. Please indicate your level of agreement with each statement, where 1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA). **Answer with respect to the acquisition team (integrated program team) for your primary responsibility in the SPO.**

		SD N SA
1.	I am willing to put in a great deal of effort beyond that normally expected in order for the acquisition team to be successful.	1 2 3 4 5 6 7
2.	I talk up the acquisition team to my friends as a great organization.	1 2 3 4 5 6 7
3.	I feel little loyalty to the acquisition team.	1 2 3 4 5 6 7
4.	I would accept any type of job in order to continue working for the acquisition team.	1 2 3 4 5 6 7
5.	I find my values and the acquisition team's values are very similar.	1 2 3 4 5 6 7
6.	I am proud to tell others that I am a part of the acquisition team.	1 2 3 4 5 6 7
7.	I would just as soon work for another organization if the work was similar.	1 2 3 4 5 6 7
8.	The acquisition team inspires the very best in me in the way of job performance.	1 2 3 4 5 6 7
9.	It would take very little change in my present circumstances to cause me to leave the acquisition team.	1 2 3 4 5 6 7
10.	I am extremely glad that I was assigned to this acquisition team over others that were available at the time.	1 2 3 4 5 6 7
11.	There is not too much to be gained by sticking with this acquisition team.	1 2 3 4 5 6 7
12.	Often I find it difficult to agree with this organization's policies on important matters relating to employees.	1 2 3 4 5 6 7
13.	I really care about the fate of the acquisition team.	1 2 3 4 5 6 7
14.	For me this is the best of all acquisition teams to work for.	1 2 3 4 5 6 7
15.	Working for this acquisition team was definitely a mistake on my part.	1 2 3 4 5 6 7

B. **The following questions should be answered with respect to your 3-letter organization.**

		SD N SA
1.	I am willing to put in a great deal of effort beyond that normally expected in order for the 3-letter organization to be successful.	1 2 3 4 5 6 7
2.	I talk up the 3-letter organization to my friends as a great organization.	1 2 3 4 5 6 7
3.	I feel little loyalty to the 3-letter organization.	1 2 3 4 5 6 7
4.	I would accept any type of job in order to continue working for the 3-letter organization.	1 2 3 4 5 6 7
5.	I find my values and the 3-letter organization's values are very similar.	1 2 3 4 5 6 7
6.	I am proud to tell others that I am a part of the 3-letter organization.	1 2 3 4 5 6 7
7.	I would just as soon work for another organization if the work was similar.	1 2 3 4 5 6 7
8.	The 3-letter organization inspires the very best in me in the way of job performance.	1 2 3 4 5 6 7
9.	It would take very little change in my present circumstances to cause me to leave the 3-letter organization.	1 2 3 4 5 6 7
10.	I am extremely glad that I was assigned to this 3-letter organization over others that were available at the time.	1 2 3 4 5 6 7
11.	There is not too much to be gained by sticking with this 3-letter organization.	1 2 3 4 5 6 7
12.	Often I find it difficult to agree with this organization's policies on important matters relating to employees.	1 2 3 4 5 6 7
13.	I really care about the fate of the 3-letter organization.	1 2 3 4 5 6 7
14.	For me this is the best of all 3-letter organizations to work for.	1 2 3 4 5 6 7
15.	Working for this 3-letter organization was definitely a mistake on my part.	1 2 3 4 5 6 7

C. 1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA). **Answers should relate to your every day duties within the integrated program team.**

		SD N SA
1.	I am able to complete my duties without interference from my superiors.	1 2 3 4 5 6 7
2.	My work is not questioned by my superiors.	1 2 3 4 5 6 7
3.	My methods in completing tasks are not questioned as long as I get results.	1 2 3 4 5 6 7
4.	I have the expertise to be successful on my own.	1 2 3 4 5 6 7
5.	I have the resources required to be successful on my own.	1 2 3 4 5 6 7
6.	The acquisition team has the expertise to be successful on its own.	1 2 3 4 5 6 7
7.	The acquisition team has access to support which is necessary for the team to be successful.	1 2 3 4 5 6 7

D. 1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA).

		SD N SA
1.	I feel free to resort to non-standardized problem solutions.	1 2 3 4 5 6 7
2.	The 3-letter organization has an accepted solution to most problems.	1 2 3 4 5 6 7
3.	Deviating from well established solutions is discouraged in the 3-letter organization.	1 2 3 4 5 6 7
4.	Creativity is encouraged in the 3-letter organization.	1 2 3 4 5 6 7
5.	I feel free to deviate from 3-letter organization policy when it is necessary to get the job done.	1 2 3 4 5 6 7
6.	Success for the acquisition team is more important than 3-letter organization rules.	1 2 3 4 5 6 7
7.	If I deviate from 3-letter policy in order to get the job done, it will adversely affect formal evaluations from the 3-letter organization.	1 2 3 4 5 6 7
8.	My success in the 3-letter organization depends solely on my performance for the acquisition team, not adherence to rules.	1 2 3 4 5 6 7

PART IV: INFORMATION ON THE ACQUISITION PROCESS

1 = "strongly disagree" (SD), 4 = "neutral" (N), and 7 = "strongly agree" (SA).

Answer the following questions as they relate to your most recently completed acquisition project within the integrated program team.

		SD N SA
1.	This project took too long to complete.	1 2 3 4 5 6 7
2.	The product is of superior quality.	1 2 3 4 5 6 7
3.	The price negotiated for this project was acceptable.	1 2 3 4 5 6 7
4.	This project was a fulfilling work experience.	1 2 3 4 5 6 7
5.	This project was successful.	1 2 3 4 5 6 7
6.	Unnecessary delays were experienced in the completion of this project.	1 2 3 4 5 6 7
7.	The overall cost of this project is too high.	1 2 3 4 5 6 7
8.	This project was a good example of effective Air Force acquisition.	1 2 3 4 5 6 7
9.	This was a highly complex project.	1 2 3 4 5 6 7
10.	Time pressure was a factor in this project.	1 2 3 4 5 6 7
11.	This project followed standard procedures.	1 2 3 4 5 6 7

SELECTED BIBLIOGRAPHY

Aiken, M., "Organizational Boundaries and Interorganizational Conflict," Human Relations, 1971, pp. 279-294.

Aiken, M., Bacharach, S., and French, J.L., "Organization Structure, Work Process, and Proposal Making in Administrative Bureaucracies," Academy of Management Journal, 1980, 23(4), pp. 631-652.

Aiken, M. and Hage, J., "Organizational Alienation: A Comparative Analysis," American Sociological Review, 1966, 31, pp. 497-507.

Aldrich, H., " Visionaries and Villains: The Politics of Designing Interorganizational Relations," Organizational and Administrative Sciences, 1977, pp. 23-39.

Allen, N. and Meyer, J., "The Measurement and Antecedents of Affective, Continuance and Normative Commitment to the Organization," Journal of Applied Psychology, 1990, pp. 1-18.

Ancona, D., "Outward Bound: Strategies for Team Survival in an Organization," Academy of Management Journal, 1990, 33(2), pp. 334-365.

Astley, G. W., and Sachdeva, P. S., Structural Sources of Intraorganizational Power: A Theoretical Synthesis", Academy of Management Review, 1984, 9(1) pp. 104-113.

Bacharach, S. and Lawler, E. Power and Politics in Organizations, 1980, San Francisco, Jossey-Bass.

Becker, H.S., "Notes on the Concept of Commitment," American Journal Of Sociology, 1960, pp. 32-42.

Blackburn, R. S., "The Dimensions of Structure: A Review and Reappraisal," Academy of Management Review, 1982, 7(1) pp. 59-66.

Bond, M. Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio. Telephone interview. 1994.

Borys, B. and Jemison, D., "Hybrid Arrangements or Strategic Alliances: Theoretical Issues in Organizational Combinations," Academy of Management Review, 1989, 14(2) pp. 234-249.

Burns, T. and Stalker, G.M., The Management of Innovation, Tavistock Publications, London, 1961.

Byrne, J. A., Brandt, R., and Port, O., "The Virtual Corporation", Business Week. February 8, 1993, pp. 98-103.

Carter, N. M., "Computerization as a Predominant Technology: Its Influence on the Structure of Newspaper Organizations", Academy of Management Journal, 1984, 27(2) pp. 247-270.

Clegg, C. "Psychology of Employee Lateness, Absence, and Turnover: A Methodological Critique and Empirical Study," Journal of Applied Psychology, 1983, pp. 88-101.

Crocker, L. and Algina, J., Introduction to Classical and Modern Test Theory. Holt, Reinhardt and Winston Inc., New York, 1986.

Dahl, R. A., "The Concept of Power", Behavioral Science, 1957, 2, pp. 201-215.

Donaldson, L. "Strategy, Structural Adjustment to Regain Fit and Performance," Journal of Management Studies, 1987, 24(1), pp. 1-24.

Edwards, A., Multiple Regression and the Analysis of Covariance. Second Edition. W.H. Freeman and Company, New York, 1985.

Emerson, R., "Power-Dependence Relations," American Sociological Review, 1962, 27, pp. 31-40.

Evan, W. M., "Toward a Theory of Inter-Organizational Relations", Management Science, 1965, 11(10), pp. B-217 - B-230.

Falbe, C. M. and Yukl, G., "Consequences for Managers of Using Single Influence Tactics and Combinations of Tactics", Academy of Management Journal", 1992, 35(3) pp. 638-652.

Fennel, M. and Alexander, J., "Organizational Boundary Spanning in Institutionalized Environments," Academy of Management Journal", 1987, 30(3) pp. 456.

Flood, R. and Carson, E., Dealing With Complexity, Plenum Press, New York, 1988.

Fredrickson, J., "The Strategic Decision Process and Organization Structure," Academy of Management Review, 1986, 11(2), pp. 280-297.

French, J. and Raven, B. "The Bases of Social Power," in D. Cartwright (Ed.) Studies in Social Power, 1959 pp. 150-167.

Galbraith, J. R., Designing Complex Organizations, Addison-Wesley, Reading, MA, 1973.

Gibson, J., Ivanicevich, J. and Donnolly, J., Organizations: Behavior, Structure, Processes, Sixth Ed., Irwin, Homewood, IL. 1988.

Glisson, C., and Martin, P., "Productivity and Efficiency in Human Services Organizations as Related to Structure Size and Age," Academy of Management Journal, 1980, 23 pp. 21-37.

Griffin, R. W., "Relationships Among Individual, Task Design and Leader Behavior Variables," Academy of Management Journal, 1980, December, pp. 665-683.

Hage, J. and Aiken, M., "Relationships of Centralization to other Structural Properties," Administrative Science Quarterly, 1967, 12, pp. 72-92.

Harrigan, K.R., "Formulating Vertical Integration Strategies," Academy of Management Review, 1984, pp. 638-652.

Hartnett, Capt R. Electronic Systems Center, Hanscomb Air Force Base, MA. Telephone interview. 1994.

Heimer, C. "Allocating Information Costs in a Negotiated Information Order: International Constraints on Decision Making in Norwegian Oil Insurance", Administrative Science Quarterly, 1985, 30, pp. 395-417.

Hellreigel, D., Slocum, J., and Woodman, R, Organizational Behavior. 6th Ed. West Publishing Co., New York, 1992.

Hinnings, C. R., Hickson, D. J., Pennings, J. M., and Schneck, R. E. "Structural Conditions of Intraorganizational Power", Administrative Science Quarterly, 1974, 19, pp. 22-44.

Hircshhorn, L. and Gilmore, T., "The New Boundaries of the 'Boundaryless' Company," Harvard Business Review, May-June, 1992, pp. 104-115.

Hodge, B.J., and Anthony, W.P., Organization Theory: A Strategic Approach, 4th Ed., Allison and Bacon, Inc., Boston, 1991.

Huber, G. "Organizational Information Systems: Determinants of their Performance and Behavior", Management Science, 1982, 28(2) pp. 138-155.

_____, "The Nature and Design of Post-Industrial Organizations," Management Science, 1984, 30(8), pp. 928-951.

Hutt, M. and Speh, T. Business Marketing Management: A Strategic View of Industrial and Organizational Markets, Dryden Press, Chicago, 1989.

Kanter, R. M., "Commitment and Social Organization: A Study of Commitment Mechanisms in Utopian Communities," American Sociological Review, 1968, pp. 499-517.

Kohli, A. "Determinants of Influence in Organizational Buying: A Contingency Approach," Journal of Marketing, 1989, 53(July) pp. 50-65.

Kohli, A., and Zaltman, G. "Measuring Multiple Buying Influences," Industrial Marketing Management, 1989 17(August) pp. 197-204.

Larson, A., "Network Dyads in Entrepreneurial Settings," Administrative Science Quarterly, 1992, 37(1), pp. 76-104.

Lawrence, P.R., and Lorsch, J.W., Organization and Environment, Richard D. Irwin, Homewood, IL., 1969.

Leifer, R. and Delbecq, A., "Organizational Environmental Interchange: A Model of Boundary Spanning Activity," Academy of Management Review, 1978, pp. 40-49.

Lenenthal, D. A. "Organizational Adaptation and Environmental Selection-- Interrelated Processes of Change," Organization Science. 1991. 2(1), pp. 140-145.

Lenz, R.T. and Engledow, J.L., "Environmental Analysis Units and Strategic Decision-Making: A Field Study of Selected Leading-Edge Corporations," Strategic Management Journal, 1986, pp. 69-89.

Levine, S. and White, P., "Exchange as a Conceptual Framework for the Study of Interorganizational Relationships," Administrative Science Quarterly, 1961, pp. 538-601.

Lucas, H. C., "Organizational Power and the Information Services Department", Communications of the ACM, 1984, 27(1), pp. 58-65.

Lundsford, J. Aeronautical Systems Center, Eglin Air Force Base, Florida. Personal interview. 1993.

Lytwak, E., and Hylton, L., "Interorganizational Analysis: A Hypothesis on Coordinating Agencies'" Administrative Science Quarterly, 1962, pp. 395-420.

Mackenzie, K. D., "Virtual Positions and Power", Management Science, 1986a, 32(5), pp. 622-642.

_____, Organizational Design: The Organizational Audit and Analysis Technology, Alex Publishing Company, Norwood, New Jersey, 1986b.

McGuire, J. B., "A Dialectical Analysis of Inter-Organizational Networks," Journal Of Management, 1988, 14(1), pp. 109-124.

Meyer, J. and Allen, N., "A Three-Component Conceptualization of Organizational Commitment," Human Resource Management Review, 1991, pp. 61-89.

Meyer, J., Allen, N., and Gellatly, I., "Affective and Continuance Commitment to the Organization: Evaluation of Measures and Analysis of Concurrent and Time-Lagged Relations," Journal of Applied Psychology, 1990, pp. 710-720.

Miles, Raymond, E. and Snow, Charles C. "Organizations: New Concepts for New forms," California Management Review, 1986, Spring, pp. 62-73.

Miller, D., "Strategy Making and Structure: Analysis and Implications for Performance," Academy of Management Journal, 1987, 30(1), pp. 7-32.

Mintzberg, Henry, The Structures of Organizations, Prentice Hall, Englewood Cliffs, N.J., 1979.

Mintzberg, Henry, Structure in Fives Designing Effective Organizations, Prentice Hall, Englewood Cliffs, N.J., 1883.

Mintzberg, Raisinghani, and Theoret, "The Structure of Unstructured Decision Processes," Administrative Science Quarterly, 1976, 21 pp. 246-275.

Mowday, R.T., Porter, L.W. and Steers, R.M., Employee-Organization Linkages: The Psychology of Commitment, Absenteeism and Turnover, Academic Press, New York, 1982.

Mowday, R., Steers, R., and Porter, L., "The Measurement of Organizational Commitment," Journal of Vocational Behavior, 1979, 14, pp. 224-247.

Nadler, D., Gerstein, M., Shaw, R. and Associates, Organizational Architecture: Designs for Changing Organizations, Jossey-Bass Publishers, San Francisco, 1992.

Neter, J., Wasserman, W., and Kutner, M., Applied Linear Regression Models. 2nd Edition. Irwin. Boston. 1989.

Nunally, J., Psychometric Theory. McGraw-Hill Book Company, New York, 1976.

Oliver, C., "Determinants of Interorganizational Relationships: Integration and Future Directions", Academy of Management Review, 1990, 15(2) pp. 241-265.

Ott, L., An Introduction to Statistical Methods and Data Analysis. Third Edition. PWS-Kent Publishing Company, Boston, 1988.

Ouichi, W., "The Relationship Between Organizational Structure and Organizational Control," Administrative Science Quarterly, 1977, pp. 95-113.

_____, "The Transmission of Control Through Organizational Hierarchy," Academy of Management Journal, 1978, pp. 173-192.

_____, "A Conceptual Framework for the Design of Organizational Control Mechanisms," Management Science, 1979, pp. 833-848.

Patchen, M., "The Locus and Basis of Influence in Organizational Decisions," Organizational Behavior and Human Performance, 1974, 11(April) pp. 195-221.

Pedhazur, E., Multiple Regression in Behavioral Research: Explanation and Prediction. 2nd Edition. Holt, Rinehart and Winston. New York. 1982.

Pennings, J., and Harianto, F. "The Diffusion of Technological Innovation in the Commercial Banking Industry," Strategic Management Journal, 1992a, 13, pp. 29-46.

_____, "Technological Networking and Innovation Implementation," Organization Science, 1992b, 3(3), pp. 356-382.

Pettigrew, A. "Information Control as a Power Resource," Sociology, 6, pp. 187-204.

Pfeffer, J., Power in Organizations, Harper Business, 1981.

Pfeffer J. and Nowak, P., "Joint Ventures and Interorganizational Interdependence," Administrative Science Quarterly, 1976, pp. 398-418.

Pfeffer J. and Salancik G, "Organizational Decision Making as a Political Process: The Case of a University Budget," 1974, Administrative Science Quarterly, 1974, 19(2) pp. 135-151.

_____ The External Control of Organizations: A Resource Dependence Perspective. 1978. New York, Harper and Rowe.

Pierce, J., Dunham, R., and Blackburn, R., "Social Systems Structure, Job Design, and Growth Need Strength: A Test of a Congruency Model," Academy of Management Journal, 1979, 22 pp. 223-240.

Porter, L., Steers, R. Mowday, R. and Boulian, P., "Organizational Commitment, Job satisfaction, and Turnover Among Psychiatric Technicians," Journal of Applied Psychology, 1974, pp. 603-609.

Robbins, S. Organizational Behavior: Concepts, Controversies and Applications, 1993. Englewood, New Jersey, Prentice Hall.

Routhier, P. Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio. Telephone interview. 1994.

Roberts, K. and O'Reilly, C., Some Correlates of Communication Roles in Organizations," Academy of Management Journal, 1979, 22, pp. 42-57.

Salancik, G. R. and Pfeffer, J., "The Bases and Use of Power in Organizational Decision Making," 1974, Administrative Science Quarterly, 1974, 19(4) pp. 453-472

Salancik, G. R., Pfeffer, J., and Kelly, J.P., "A Contingency Model of Influence in Organizational Decision-Making", Pacific Sociological Review, 1978, 21(2), pp. 239-255.

Schoorman, F.D., Bazerman, M., and Atkin, R., "Interlocking Directorates: A Strategy for reducing Environmental Uncertainty," Academy of Management Review, 1981, pp. 243-252.

Schoemerhorn, J., "Determinants of Interorganizational Cooperation," Academy of Management Journal, 1975, pp. 846-856.

Schoper, J., "Interorganizational Groups: Origins, Structure, and Outcomes," Academy of Management Review, 1987, pp. 702-713.

Scott-Morton, M. S., The Corporation of the 1990s: Information Technology and Organizational Transformation, Oxford University Press, New York, 1991.

Simon, H. "On the Concept of Organizational Goal" Administrative Science Quarterly, 1964, 9(1) pp. 1-22.

Spekman, R., and Moriarty, R., "An Exploratory Investigation of Perceived Time Pressure and Its Effects on Industrial Buying Behavior," Conference of European Marketing Academy, June, 1986, Helsinki.

Thompson, J. Organizations in Action. McGraw Hill, New York, 1967.

Thorelli, H. B., Networks: Between Markets and Hierarchies," Strategic Management Journal, 1989, pp. 37-51.

Todd, Col W. Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio. Telephone interview. 1993.

U. S. Government. Munitions Systems Division Acquisition Process Improvement Team (MAPIT) Final Report. 1992.

U. S. Government. Office of Management and Budget. Office of Federal Procurement Policy. The Federal Acquisition Regulation. Government Printing Office. Washington D.C. 1992.

Van Fleet, D. D. and Yukl, G., Military Leadership: An Organizational Perspective, Jai Press, London, England, 1986.

Walsh, J. and Ungson, G., "Organizational Memory," Academy of Management Review, 1991, 16(1) pp. 57-90.

Warren, R., "The Interorganizational Field as a focus for Investigation," Administrative Science Quarterly, 1967, pp. 396-419.

Weick, K. E., The Social Psychology of Organizations, Addison-Wesley, Reading, MA., 1969.

Weick, K. E., "Educational Organizations as Loosely Coupled Systems," Administrative Science Quarterly, 1976, pp. 1-9.

Weiner, Y., "Commitment in Organizations: A Normative View," Academy of Management Review, 1982, pp. 418-428.

Weiner, Y., and Vardi, Y., "Relationships between Job, Organization, and Career Commitments and Work Outcomes: An Integrative Approach," Organizational Behavior and Human Performance, 1980, pp. 81-96.

Wilmont, H., "The Structuring of Organizational Structures: A Note," Administrative Science Quarterly, 1981, pp. 470-474.

Yukl, G. and Falbe, C. M., "Influence Tactics and Objectives in Upward, Downward, and Lateral Influence Attempts", Journal of Applied Psychology, 1990, 75(2) pp. 132-140.

_____, "Importance of Different Power sources in Downward and Lateral Relations", Journal of Applied Psychology, 1991, 76(3) pp. 416-423.

Zigurs, I., Poole, M., and DeSanctis, G. (1988). "A Study of Influence in Computer-Mediated Group Decision Making," MIS Quarterly, 1988 12 pp. 625-644.

Zmud, R. W., "Opportunities for Strategic Information Manipulation Through New Information Technology," in Organizations and Communication Technology, Fulk and Steinfeld (eds.), Sage, 1990.

BIOGRAPHICAL SKETCH

CAISSON MOATES VICKERY

Caisson Moates Vickery was born 23 May 1962. Upon graduation from Harvard University in 1984 he was commissioned a Second Lieutenant in the United States Air Force. Caisson Presently holds the rank of Captain. Caisson will be an Associate Professor of Acquisition Management at the Air Force Institute of Technology at Wright-Patterson Air Force Base in Ohio.

Professional History

1994-	Associate Professor of Acquisition Management at the Air Force Institute of Technology, Wright-Patterson AFB, OH. The Air Force Institute of Technology is responsible for the Graduate level Degrees awarded to Professional Air Force Officers.
1991-1994:	Candidate for Doctor of Philosophy degree in Information and Management Sciences at the Florida State University. Degree Awarded December 1994.

1990-1991:	Chief B-2 Logistics and Cost Reductions Group. B-2 System Program Office, Wright-Patterson AFB, OH. Supervisory Procuring Contracting Officer in charge of all Logistics, Support Equipment and Cost Reduction Initiatives on the $63 billion Advanced Technology Bomber program. Supervised and managed a group of five contract managers.
1989-1990:	Contract Manager, B-2 System Program Office, Wright-Patterson AFB, OH. Responsibilities included overseeing the critical Cost Reduction Initiative program that will save the Air Force an estimated $4 billion over the production life of the B-2.
1988-1989:	Candidate for Master of Science in Contract Management at the Air Force Institute of Technology, Wright-Patterson AFB, OH. Degree completed in September 1989. Distinguished Graduate.
1986-1988:	Contracting Officer, Directorate of Research, Development, Test and Evaluation Contracts, Eglin AFB, FL. Duties are the same as a contract negotiator, but also responsible for the supervision, review and signature of the work of four contract negotiators. Acquisitions ranged from Strategic Defense Initiative support to Non-personal Services contracts.
1984-1986:	Contract Negotiator, Directorate of Research, Development, Test and Evaluation Contracts, Eglin AFB, FL. Duties included initial planning through negotiation, award and administration of complex R&D programs. Acquisitions varied from advanced scientific studies to fabrication of advanced missile hardware.

Education

Professional Military Education:	Squadron Officer School completed by correspondence, 1987; completed in residence 1990.
Formal Education:	Ph.D. in Information and Management Sciences, 1994, Florida State University.
	MS in Contract Management, 1989, Air Force Institute of Technology (Distinguished Graduate).
	BA in Economics, 1984, Harvard University.
	Distinguished Graduate of Detachment 365 (Massachusetts Institute of Technology) ROTC, 1984.
Technical Training:	Central/Systems Level Contracting Course, 1984, Lowry AFB, CO.
	Principles of Contract Pricing, 1985, Wright-Patterson AFB, OH.
	Government Contract Law, 1986, Wright-Patterson AFB, OH.
Professional Affiliations:	National Contract Management Association
	Professional Designation in Contract Management from AFIT/NCMA
Honorary Societies:	Sigma Iota Epsilon (Management Sciences)
	Alpha Iota Delta (Decision Sciences)